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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Managing Editor* SID NOBLE, *Editor*

Editorial Offices: 19 West 44th Street, New York

VOLUME XI NUMBER SIX

TABLE OF CONTENTS, DECEMBER, 1928

Holly Time 3
Jeff Tells Us How to Celebrate It

A Potash-hungry Soil 5
A Fertility Story, by J. W. White

Delaware 8
The Story of the Experiment Station, by C. R. Runk

Field Bindweed 13
How to Kill It, by F. E. Charles

The County Agent in an Emergency 14
Should Be Equal to the Occasion, by J. William Firor

Cotton Needs Potash 15
Some Striking Experiments, reported by R. B. Fairbanks

Farm Conditions 18
The General Situation as Shown by What the Farmer Does, by Arthur P. Chew

A Shucking Contest 23
One Way to Get Farmers to See a Demonstration, by W. H. Byrne

Agriculture Today 24
The Second of Frank George's New Series

A 100-Bushel Club 27
A Story of Some Hustling Youngsters, by Jesse A. Wood

L. R. Barton, Optimist 28
Does Not Think Present Times So Hard, by H. N. Wells

Potatoes 30
The First of a New Series of Crop Stories, by Walter H. Ebling

Agricultural and Scientific Bureau
N. V. POTASH EXPORT MY.
of Amsterdam, Holland
Directors: J. N. HARPER G. J. CALLISTER

Lo! now is come our joyful'st feast!
Let every man be jolly.
Each room with ivy leaves is drest,
And every post with holly.

—WITHER

Better Crops with Plant Food

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Vol. XI NEW YORK, DECEMBER, 1928 No. 6

Jeff says, "You must be a part of what you part with."

Holly Time

By Jeff McDermid

POST-CARD designers, sketchy correspondents, and motto mongers who persist in lazily writing it "XMAS" have my sympathy. By their own admission in perfectly good algebra, the Originator of the Day is to them an unknown quantity.

This is my only peeve at Holly Time—the only incident in the whole season of buy and bustle that in the least way makes me intolerant. To mar the great name of our best holiday by using the sign manual of an illiterate, and to do so without logical excuse whatsoever is enough to turn merry Tom Pinch into the most sullen of Scrooges. Now that this petty irritant is off my chest like an old-fashioned court plaster, let us turn to the subject in hand with all the enthusiasm becoming such a happy theme.

Christmas is a children's holiday in our minds because it has been such to each and all of us in our fondest personal memories. It takes us all back home.

Children remember Christmas as the time of exchanging presents. Some of us recall past Christmases by the gifts we *received;* while others conjure up and hold most dear those Christmases when things or services were *given* to those in need out of the fulness of a kindly heart.

Whether we prefer to be collectors or distributors at Christmas time de-

pends upon the propensities to selfishness or generosity gained in childhood.

Exchanging presents or the donation of gifts in itself has no relation to Christmas because it was a custom among mortals long before Christmas originated. I recall that my friends in Dakota, the Oglalla Sioux, told me that for centuries it has been their custom to have a "give away" at funerals, wherein the mourners pass out all of their personal belongings to the guests.

IN former times, before man had nerve enough to venture outside of a castle without his armour on, the giving of presents was largely a groveling tribute or a sly bid for favor. As long as men were ruled by fear and dominated by greed, the exchanging of presents must have been a futile old farce.

But if we recall the Christmas happiness of Tiny Tim, despite his cruel infirmity, or see again the ecstasy of poor, abused, little Cossette when Jean Valjean gave her a doll in the sordid old inn—then do we receive anew the perspective of a richer form of giving and of living.

For the chief secret of its alchemy of delight is this: that *living* is *giving* and *giving* is *living*, whether it be on December 25th or not. Those ancient and variously interpreted forms of giving have been transformed by means of Christmas to a nobler plane. Unselfish interest in the lives and welfare of others cannot be substituted by any flashy present, from a set of tiddley winks to a diamond tiara. You can't live unless you give, and you can't give unless you live!

In other words, you must be a *part* of what you *part with*. Likewise, the receiver must give a *token* with all that's *taken*, instead of forgetting about the love that lies behind the gift and trying to trade it back tomorrow at the dime store!

I was brought up in a Yankee home, presided over by a dear Mother, the memory of whose voice reciting Moore's "Night Before Christmas" comes once more as a benediction. Yet we lived in a settlement of cosmopolitan people, and it was from them that I learned the variations in the holiday theme as traced in the legends and traditions of the world.

We had neighbors who brought in the Tannenbaum, the German festive fir tree, in remembrance of the custom of ancestors who spent Weihnachtsabend along the glittering Rhine. We children joined their chorals and nibbled their spicey Kuchen. Other good neighbors told us of "Jule Nissen," the Danish sprite of countless Christmas revels in their native land. John Van der Donk, our township chairman, taught his children to watch for Saint Nicholas and to expect their wooden "klompen" to be full of stick candy on the morrow's dawn. One Italian family spoke with mysterious gladness of "Il Santissimo Bambino," the saintly child of the cloister where the candles were brightest on Christmas eve. Our jolly English friends contributed roast beef, plum pudding, and masquerade pantomimes to the potpourri of Yuletide lore which our neighborhood could muster.

Sometimes it was hard for the foreign-born parents to understand all their neighbors said in ordinary daily intercourse, but they did not need us children to open their hearts and feelings toward each other at Christmas time. Smiles and handclasps require no interpreter.

IN fact, it was an American community which asked only of its members that they lay aside morbid cares and petty foibles to join in an interval of wholesome fellowship under the light of the winter stars.

Our best foundations for a united, understanding America were laid and

(*Turn to Page* 61)

Annual Field Day and Picnic, Bradford County, Pennsylvania, Experiment Fields. Farmers studying the effects of fertilizer treatments on the production of the several crops.

A Potash-hungry Soil

By J. W. White

Soils Research Chemist, Pennsylvania State College

IN northeastern Pennsylvania among a succession of smooth contoured hills and narrow, steep-sided valleys is found the soil which becomes the subject of this story. Derived from a mixture of glacial till, decomposed shale and sandstone, this soil which we call Volusia is worthy of special consideration.

From the scenic standpoint this section of the Keystone State claimed by Volusia soil fills all the requirements of the landscape artist. With little imagination he should be able to depict on his canvas the invasion of the great ice barriers from the north which left so clear a record on the smooth-topped hills of Bradford county.

Traveling north from Williamsport toward Elmira on the Northern Central, we leave the train at Columbia Cross Roads, or if you prefer to travel by auto go direct to Springfield. Better come in August for each year at that time is held our annual field day and picnic. From three to five thousand farmers and their families gather on this day for pleasure and serious thought concerning the problems of economic farming, with special reference to the production of crops upon which they are dependent for the maintenance of the dairy industry, so highly developed in northern Pennsylvania.

Since the establishment of our field plot experiments this soil has been subdivided into Volusia, Wooster, and Canfield. Each of these is represented in the field experiments. The three soils include gravelly silt loam and differ with respect to drainage and depth of soil. In relation to our field

experiments, the term Volusia soil therefore includes, to a limited extent, these other two soils. Volusia soil mass is normally three feet or less in depth resting on broken shale or sandstone. The subsoil is generally heavy, frequently a silty clay or clay that is quite impervious to water. In many cases, the glacial material represents but a small part of the soil mass. The soil is poorly drained and very sour and is typical of our so-called "late soils."

This "Volusia group" of glaciated soils includes 19.4 per cent of the state soil area and is located in the northeastern and northwestern sections of the State. The chemical composition of Volusia soil differs from other soils of the State in that it contains relatively high percentages of organic matter, nitrogen, and phosphorus, and a low percentage of potash and lime. Compared to our Hagerstown series of limestone origin, our most productive soil of the State, Volusia soil is 49 per cent higher in nitrogen and organic matter, 46 per cent higher in phosphorus, but contains 30 per cent less total potash. The value of potash in the production of crops on Volusia soil as compared to the soil's response to applications of phosphorus and nitrogen is parallel to the proportions of these plant food elements present. This statement is especially true in case of the relative value of these three fertilizer constituents in the four-year rotations.

Local Farm Conditions

A study of the local farm conditions prior to the establishment of the field plot experiments, brought out some interesting facts concerning the farming system, or lack of system followed in this remote and rural section of the "North Tier" county where the roads are heavy and the haul is long—the home of the little farmer who lives over the hill and not very far from the poor house. The soil is too wet in the spring and likewise too dry in the summer.

The shallow rooted plants which fail to send their roots deep into the wet soil are caught when the drouth comes. It becomes evident that drainage is the first essential, but it costs about $40.00 per acre and the land is valued at about $15.00 to $30.00 per acre. No doubt tile drainage would double the value of the land per acre, and a drainage experiment is now under consideration. The extreme acid condition of the soil, associated with poor drainage, was found to be another limiting factor.

Rotations Vary

The crop rotation followed was found to vary considerably usually in accordance with weather conditions. Every farmer has lots of land (too much) and is privileged to rotate to his heart's content in any direction. The following rotation is followed by those who despoil the land without thought of tomorrow — oats, clover and timothy, timothy six years, timothy and daisies two years, daisies and paint-brush one year, and on the twelfth year the land is plowed for corn, but it rains and it is seeded to buckwheat.

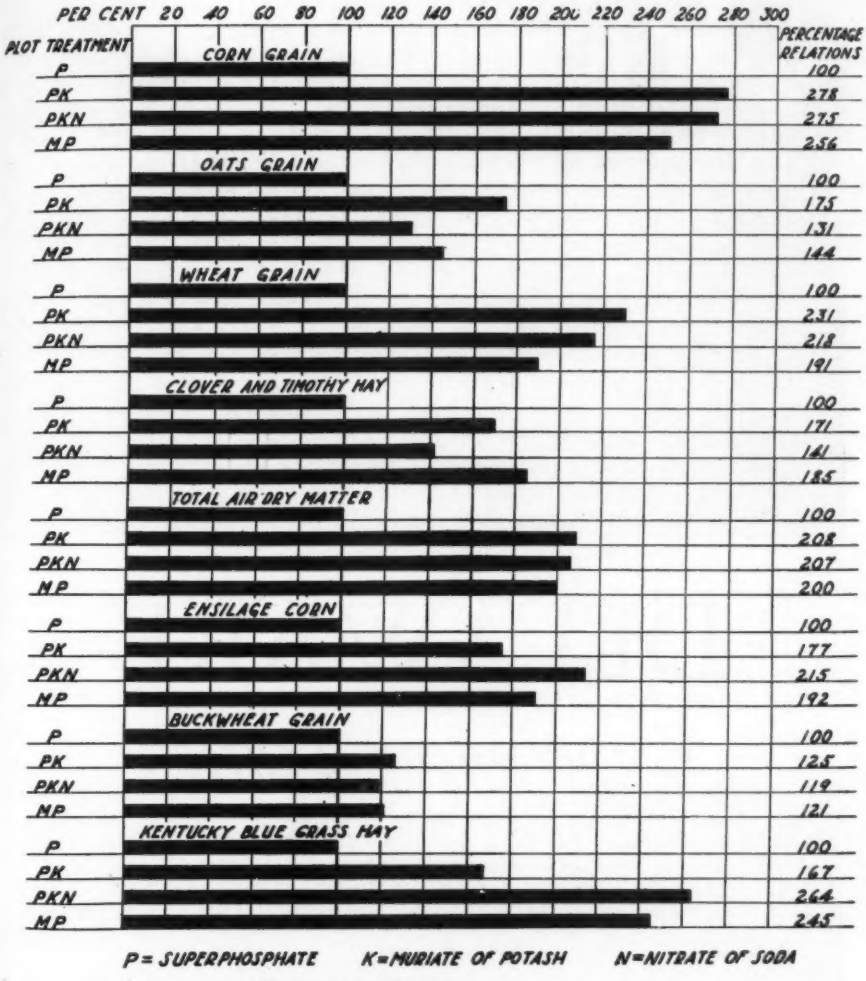
The soil under proper management where deep plowing is followed, produces excellent ensilage corn, buckwheat, and hay. The grazing land supplies abundant early grazing, largely red top and timothy, but the grazing season is too short and the dairy farmers are spending too much of their milk checks for summer feed. The county stands first in hay and buckwheat, and near the top in the production of milk, honey, maple syrup, and eggs. It is truly a land of milk and honey. If acid soils are conducive to a sour disposition, then the Bradford county farmer should consume all his honey and maple syrup.

In the spring of 1918, the Pennsylvania Agricultural Experiment Station established a series of field plot experiments on Volusia soil on land typical

RELATIVE VALUE OF COMMERCIAL FERTILIZERS AND MANURE IN THE PRODUCTION OF CROPS ON VOLUSIA SOIL

BRADFORD COUNTY EXPERIMENT FIELDS 1918-1927

P (SUPERPHOSPHATE) = 100



P = SUPERPHOSPHATE K = MURIATE OF POTASH N = NITRATE OF SODA

MP = 6 TONS REINFORCED MANURE

The above chart shows clearly the relative values of the four treatments in the production of the seven crops on Volusia soil. Potash stands out conspicuously as a major factor in the production of crops on this soil.

of that described above. These experiments include 102 plots arranged in six fields and including several different cropping systems. The various experiments were planned to test the comparative value of various forms, combinations, and amounts of commercial fertilizers, lime, and manure in the production of the more common crops grown in Pennsylvania. The detailed report of the first eight years' results is published in bulletins 211 and 229 of the Pennsylvania Agricultural Experiment Station.

This paper is limited to the results

(*Turn to Page* 59)

Wolf Hall, office and laboratory headquarters of the station.

DELAWARE

Experiment Station

By C. R. Runk

Former Associate Agronomist, Delaware Experiment Station

DELAWARE'S experiment station was founded in 1888 at what was then Delaware College, now the University of Delaware, located in Newark. A study of the early reports reveals that at that time the station employed a director and four men for part time teaching and part time experimental work. This was largely in the nature of demonstration and control work. Permanent field experiments were started in 1908. Since that time the activities have broadened out into many lines of investigation until now a total force of 24 is employed in research work.

The station has been particularly fortunate in retaining its directors. There have been but three directors in 40 years. Arthur T. Neale served from 1888 until retirement in 1906. He was succeeded by Harry Hayward who remained until 1919. C. A. McCue has been Dean of the College of Agriculture and Director of the Experiment Station since 1919.

In agronomic work the first fertilizer experiments were begun with fertilizers in rotations and continuous cultures. Almost the entire state

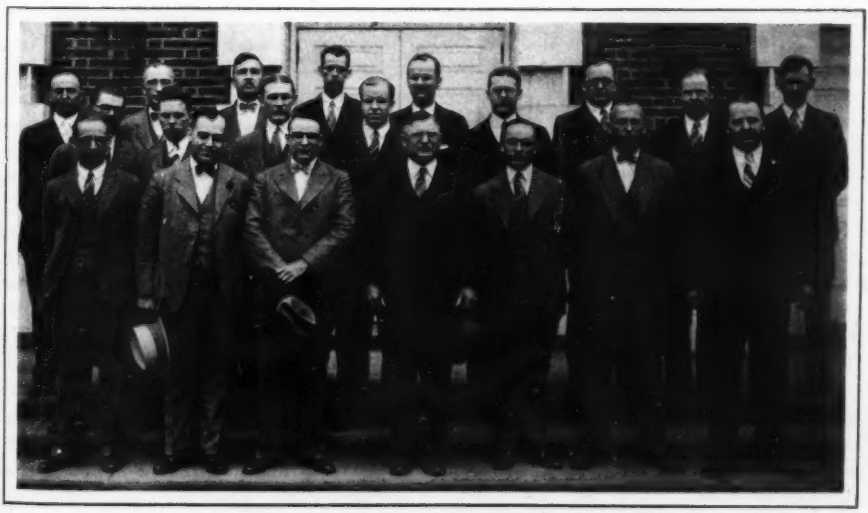
consists of the Coastal Plains soils and the experiments have been concerned largely with the Sassafras and Norfolk series of this region.

The oldest series of fertilizer plots at the station have been in progress since 1908. The results have been published in Bulletins (137, 138, 146). Subsequent experiments deal with (1) rotations, (2) fertilizer ratios and rates for the more important crops for Delaware, (3) pasture mixtures and fertilization, (4) fertilization of meadows, (5) testing and improvement of varieties of corn, wheat, oats, soybeans, alfalfa, and clovers, (6) relation of soil acidity and crop growth, (7) the use of lime, (8) green manures and cover crops.

The soils of the state vary from sands and loamy sands in the southern part of the state to clay loams and silt loams in the northern part. Consequently the station has experimental fields located on the various soil types throughout the state, to study the relationship of soil type to the different experiments in progress. Description of these experiments and some of the results obtained have been published in the various bulletins issued by the experiment station.

Through an experiment completed several years ago on a peach orchard with commercial fertilizers including nitrogen, potash, and phosphoric acid, the horticultural department has demonstrated the need of maintaining a higher nitrogen content for soils in Delaware and similar soils elsewhere. A new peach orchard was established in 1921 in which 10 test blocks were located to discover the best source of nitrogen for peach production. Conclusive results are not yet at hand.

The dropping of immature orchard tree fruits is a problem that has occupied the attention of the department since 1921. By sectioning the shed fruits at various intervals of time, beginning with the petal fall stage, it was found that lack of pollination and fertilization were not chief factors in the dropping of such fruits but that some other factor, not yet discovered, was the deciding one. A few years ago a genetic factor was discovered which seems to so regulate the time of abscission that trees of different varieties and different species and kinds shed their fruits in unlike waves. A large number of factors of environment have been studied, but so far no relationship between these and normal dropping of fruits has been discovered.



The staff of the Delaware Agricultural Experiment Station.

Another problem closely studied by the department is heredity and improvement in cabbage. Cabbage is a crop that always has been taken for granted as being just plain cabbage. Aside from the question of season of maturity, very little has been done to improve the crop. The department during the last six years has uncovered and pointed out a number of factors touching on the heredity of the plant. Annual blooming or "bolting," as it is popularly termed, has been shown to be fundamentally of a hereditary nature although it may be modified by environmental factors. Sterility of the plants has been pointed out and particularly that due to incompatibility in its several forms. The value of selection in the breeding of different strains has been emphasized. The heredity of headlessness, plant size and color, leaf character, type of inflorescence, shape of head, and season of maturity are some of the characters studied. The lack of uniformity in cabbage varieties illustrates the variability in most of the garden crops.

Fertilizer Experiments

In 1927 an experiment was concluded on the relation of fertilizers to apple production especially in regard to the three elements, nitrogen, phosphorus, and potassium. The clean culture system was used in this experiment. The main conclusions reached were these: wherever nitrogen was applied, fruit production increased; where no nitrogen was applied, the trees grew as best they could, taking whatever was available in the soil, and then grew less and less each year until very little growth and very little fruit was produced. Wherever nitrogen was applied, the response was noticeable in increased vegetative growth and fruit production. However, without other elements, especially phosphorus, maximum production was not attained. Nitrogen was found to be the chief limiting factor, followed by phosphorus.

Studies of the effect of nitrogen on the internal composition of the apple tree and its relation to fruit production have been under way for several years.

The effect of nitrogen from different sources on the time of fruit bud differentiation in the Elberta peach, is being studied and will be reported soon.

The old but unanswered question of whether to make single or split applications of nitrogen to apple trees in early spring, is receiving attention, as is also the question of fall applications.

The need of maintaining organic matter in our soils is acknowledged as the most serious cultural problem in our orchards. This is particularly so in the sandy soils of Sussex county. Accordingly, a study of what crop will best serve this purpose is being made in a large peach and apple orchard in Sussex county.

Through the application of 20 pounds of nitrate of soda early each spring, an attempt is being made to throw some 20-year-old Stayman and Paragon apple trees into an overvegetative condition.

Because of hereditary differences in seedling rootstocks, an attempt is being made to establish trees upon their own roots. If this can be accomplished, a study will then be made to determine the variation between self-rooted trees and similar trees grafted upon seedling stocks. If less variation is found to occur in the trees on their own roots, we shall have eliminated one of the supposedly unavoidable errors in all experimental work to date on apple trees.

At this station, as in other orchard sections of the country, the pollination problem is likewise a vital one. Studies at this and other stations have shown the J. H. Hale peach to be self-sterile from a commercial standpoint, but it has been found to set well when interplanted with Belle of Georgia, Hiley, or Elberta. The Scarlet Pippin, Crimson Beauty, Nyack Pippin, Chaplain, and Lilly of Kent apples were also found to be practi-

cally self-sterile, but were successfully pollinated with other varieties.

The increased funds provided by the Purnell Act made it possible for the station to begin research work in agricultural economics in 1925. The first study made by the department was the "Marketing of Delaware Eggs" published in 1927. At the present time the department is making a study on the marketing of Delaware sweet potatoes. In addition to this a study in farm taxation is about half completed. An investigation to study the effects of land tenure upon types of farm management found in the state is now in progress. As soon as these studies are finished, other investigations, which have already been planned, will be started both in the fields of marketing and farm management.

Director C. A. McCue.

The chemical department of this station, for the past eight years, has been interested in the hydrogen ion and its relation to the growth of seedlings, to the physico-chemical properties of soils, and to the formation of fruit jellies. The work was started when there was very little information on the determination of hydrogen ion concentration so that the technique involved had to be developed as the work progressed. This station was among the first to show the effect of hydrogen ion concentration on the growth of seedlings in nutrient solution, and among the first to study the relationship of hydrogen ion concentration to certain soil phenomena.

It was the first to point out that the formation of fruit jellies is controlled by the hydrogen ion concentration of the juice rather than by its total acidity. A very thorough investigation of the factors influencing jelly formation subsequently followed and is still being pursued. So far five bulletins have been published on fruit jellies.

A contribution of considerable importance to soil science may develop from a study of the "Mechanism of Buffer Action in Soils" now being conducted at this station. Buffer action of soils has been associated with their colloidal content, since soils low in colloidal matter exhibit little buffer action, while those high in colloidal content exhibit considerable buffer action. But when the colloidal fraction is removed and electro-dialized the buffering power of the colloid disappears so that it cannot be attributed directly to the colloidal fraction but to the ions that are held by the colloidal fraction either by electro static attraction, adsorption, or double decomposition.

The major experiment in swine feeding is the study of the utilization of ground soybeans for fattening pigs. Feeding trials have been conducted under dry-lot conditions and in connection with forage crops. A study of forage crops for Delaware is being carried on at this time.

A study of the effect of using superior sires upon a foundation herd of mediocre purebred Holstein cows is in progress. An experiment with powdered skim-milk for rearing dairy

calves is now being carried on. Trials covering a period of two years indicate that ground soybeans are two per cent less efficient for milk production than peanut meal.

Experiments are in progress to determine the most efficient utilization of soybeans for growing chicks and for laying pullets. An experiment covering a period of three years indicates that artificial illumination materially increases winter egg production. It was found that eggs could be produced more economically under artificial illumination during the winter months than under natural conditions. A breeding experiment with Single-combed White Leghorns has been in progress for several years. Other experiments deal with the confinement of laying pullets without succulent green food and with the all-mash method of feeding laying pullets.

Plant Diseases Studied

Work in plant diseases is distributed over a number of major crops because of the extensive diversification of crops grown throughout the state. The study of plant diseases of sweet potatoes has been continued over a number of years and only recently pox or soil rot was found to be caused by a form of fungus closely related to that which causes the scab of white potatoes. Investigations on the major diseases of this crop have been completed and the principal control measures are seed selection and treatment along with proper rotations and good fertilizing.

The cucurbits including cantaloupe, cucumber, and watermelon have long been troubled with foliage diseases which have been thoroughly studied and respond to treatments that are now becoming accepted. Copper-lime arsenate dust has proved effective in controlling foliage diseases and has also resulted in improving quality and greater yield.

Considerable attention is also being given to the breeding of resistant tomatoes as well as the control of tomato root-rot. This crop is one of the extensive canning crops planted throughout the state.

Orchard diseases are of considerable importance. Studies on fruit spot, bitter rot, bacterial spot of peach, and peach yellows are being conducted. An extensive spray service is being supplied to the growers of the state.

Some of the projects completed recently have covered the diseases of canning peas, root, stock, and ear rot of corn, apple scab, disease of cabbage, and grape diseases.

Much work is being done in soil bacteriology covering the biological processes in soils and composts that make for the most economic returns from the practices of fertilizing, manuring, and liming. The proper reinforcement of manure and humus has been given much consideration, particularly the nitrogen and mineral requirements for maximum results.

Much attention also has been given to the important bacterial processes in the soils known as nitrogen fixation, both that of the symbiotic bacteria (those working in the nodules of legumes) and the non-symbiotic in maintaining the nitrogen supply. The great importance of cellulose (organic matter in the soil) in feeding these nitrogen fixers has been shown. In all general farming, these bacterial processes of nitrogen fixation are supplying many times the nitrogen that is supplied by fertilizers and manures.

The results of the experimental work of the Delaware station have been published in some 200 bulletins and circulars and in various journals and periodicals. No attempt will be made in this article to summarize the accomplishments of the station. The staff, like those of other stations, can point with considerable pride to the work that has been and is being done for the agricultural industry of the state and nation.

Field Bindweed

By F. E. Charles

Kansas State Agricultural College

FIELD bindweed, or wild morning glory, designated as the most serious weed pest ever to infest Kansas fields, can be effectively controlled and eradicated by the use of sodium chlorate spray. This has been demonstrated in experimental work at the Kansas Agricultural Experiment Station at Manhattan, Kansas.

The tests have been made by Prof. J. W. Zahnley of the agronomy department and Prof. W. L. Latshaw of the chemistry department of the college. The sodium chlorate solution is made by adding one pound of the chemical to a gallon of water. A hundred gallons of the solution will treat an acre.

Three rules have been laid down by the Kansas station for bindweed control. First, only seed that is positively known to be free from bindweed should ever be planted. Small grains, such as oats, wheat, and barley, are the most common to carry seed of the field pest. The State Board of Agriculture maintains a seed-testing laboratory where field seed will be tested free of charge. Second, every farmer should learn to recognize bindweed at first sight and keep on the lookout for it. Third, the pest must be fought persistently from the time the first plant is noticed.

Three or sometimes four applications of the sodium chlorate solution are necessary to completely kill the bindweed. The first spraying should not be made until the plants have reached full bloom. If made earlier there will be some shoots not yet out

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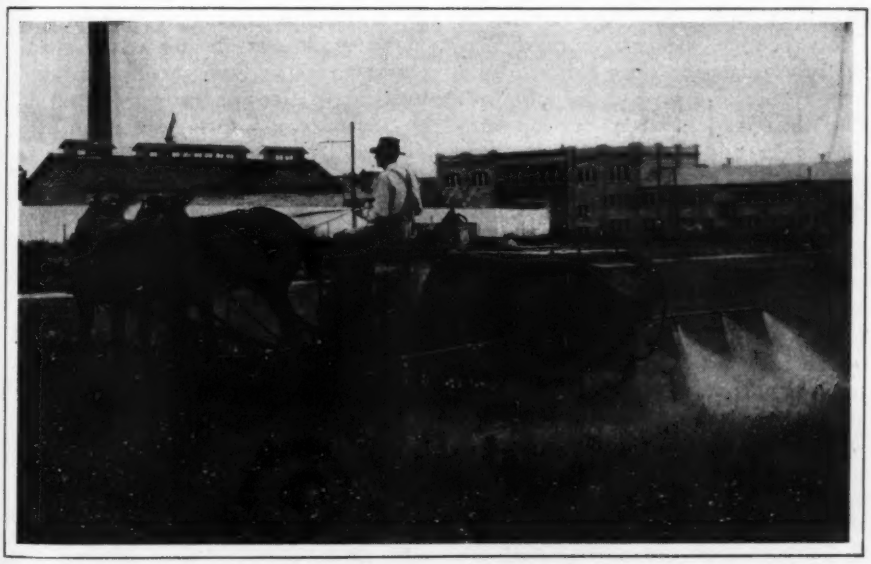


A power spray may be used effectively on large fields which are infested with bindweed.

The County Agent in an Emergency

By J. WILLIAM FIROR

Georgia State College of Agriculture

AN emergency situation calling for immediate attention is likely to develop in any county at any time. The appearance of a new insect pest, a variation of rainfall greatly above or below normal, the cutting off of the outlet for some staple crop, or seasonal conditions favorable for some crop pest which has been of minor importance for several years may bring about an emergency from the standpoint of the farmers and the county agent.

I am thinking of hard practical problems needing immediate treatment and not those conditions which create a great deal of political discussion and newspaper treatment, finally getting nowhere. For example, during the month of June, 1926, the farmers of Dooly county, Georgia, noticed that the tiny squares on their cotton plants were turning brown and dropping off. The squares of cotton develop into the flower and finally into the boll, containing the fibre. Injury to the squares means no cotton.

County Agent E. C. Mann had been noticing this injury. More and more fields showed the symptoms. He met with his agricultural board and advised them that the trouble was due to the cotton hopper or so-called cotton flea; that it was possible that after a few weeks the hoppers would leave the cotton fields, but it was also likely that they might do serious damage if conditions were favorable to their development. He suggested that if farmers were not immediately informed of the dangers of this new insect trouble and also advised of correct control methods, a near panic might be created owing to the fact that during the past 10 years the coming of the boll weevil and the deflation after the World War had made farmers fearful of uncertainties, and surely the cotton hopper was uncertain. The agricultural board decided that the best thing to do was to inform everybody of the true nature of the new trouble.

Spreading Information

It was of course impossible for the county agent to visit every farmer in the county or any considerable percentage of them. As it was necessary to point out the insect and its method of work, meetings were impractical. However, it was possible to visit several farmers in each community and by selecting leading farmers to act in the capacity of informers, enough people could be reached in a few days to get across the correct information about this insect.

County Agent Mann was thus able to get to his farmers the solution for the situation quickly and accurately. Without his good judgment there might have been hundreds of conjectures and possibly an equal number of suggested remedies, many of which would have been worse than nothing.

Besides this sort of emergency where the county agent deals with the situation as a county unit, I have in mind another which shows sectional action and group cooperation. During the

(*Turn to Page* 53)

Cotton Needs Potash

By R. B. Fairbanks

THAT rust and wilt both reduce the cotton yield very materially, is a well-known fact. It is equally well known to those who have given any study to the matter, that liberal fertilization with potash will almost entirely prevent these diseases. It is only in recent years that it has been generally known that liberal applications of potash would very greatly reduce the damage done by wilt. Potash is not a cure for these diseases, but is an almost sure preventive of rust. If applied in liberal quantities, before a piece of soil becomes infested with wilt, potash will reduce this disease to a very appreciable extent.

The thinking cotton growers understand that a liberal application of potash fertilizer is most highly desirable for cotton, when planted on cold, or crayfishy types of soil. Considerable increases in cotton yields also have been secured from liberal potash fertilizer applications on the brown loam, or sassafras loam soils, such as are quite common in West Tennessee. A test on a Madison county, Tennessee, farm this year on soil that is described as sassafras loam, and which was not wet, nor infested with wilt, nor attacked by rust, showed a very considerable increase in cotton. Some estimated it as much as 25 per cent; some as low as 15 per cent. Even with a 15 per cent increase, the potash application paid a handsome profit.

Where rust is prevalent, it is foolish not to use potash liberally. Recently we saw a test in a field where 600 pounds of 8-6-0 fertilizer were applied as compared to 600 pounds of 8-6-8. The portion that received the 8-6-0 fertilizer rusted badly and the plants were entirely defoliated in August. The result was that the bolls on the defoliated plants were stunted and six average stalks had only 28 stunted bolls on them. Six average stalks where 600 pounds of 8-6-8 fertilizer were applied had 57 bolls on them and would certainly yield twice as much per boll as the cotton which did not receive the potash fertilizer. It is, therefore, not over-stating it in the least to say that the potash increased the cotton yield in this instance by three or four times.

The six stalks that had not received any potash fertilizer had a shallow root system; were very easily pulled up; and in fact were stunted stalks in every sense of the word, having died along in August, making it impossible for anything like a normal yield of cotton to be produced. Instances of this kind could be multiplied over and over again by inspecting fields where rust is prevalent. Where rust is bad, the cotton yield is frequently divided in half and some times considerably more.

Keeps Cotton Growing

It is also noticeable on practically all types of soil, that cotton receiving a liberal application of potash fertilizer along with nitrogen and superphosphate remains green late in the season, and produces cotton right up to frost. In other words, the top bolls, or the late ones, frequently develop completely, whereas cotton that did not receive the potash fertilizer ceases to grow much earlier. Very often this top crop alone may mean the difference between a profit and a loss.

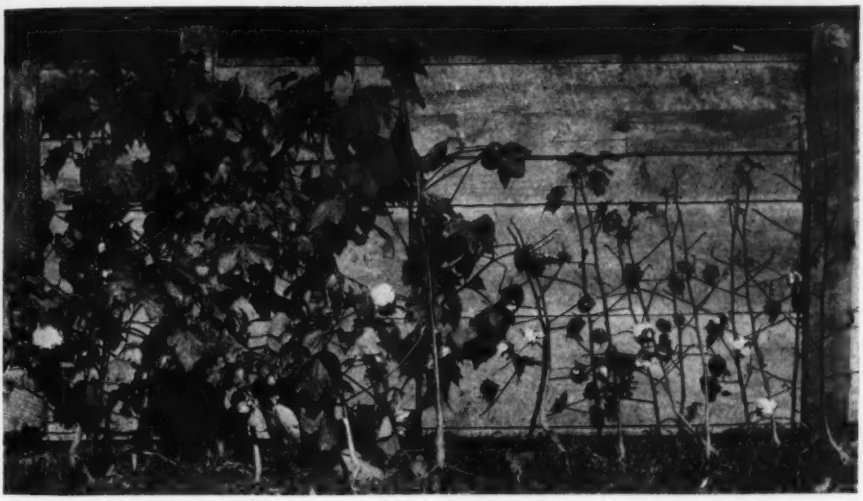
Then, too, one often hears the state-

Rust has almost defoliated the cotton to the left liberally fertilized with an 8-6-0. To the right the cotton is green, vigorous, and growthy. It was fertilized with an 8-6-8.

ment made that heavy potash fertilization, along with nitrogen and superphosphate, delays maturity of cotton. Many think this to be true by making a casual observation, whereas, if a more careful inspection was made it would be found that this conclusion is drawn because the leaves of the cotton remain green longer and hide the open bolls, thus making it appear that this cotton is slow in maturing and opening. A count of the bolls almost invariably reveals that there is nothing to this frequent statement that potash delays the maturity of cotton.

A careful study will reveal to any one that there are few if any types of soil to which an application of potash fertilizer will not pay on cotton, provided, of course, that a grower also

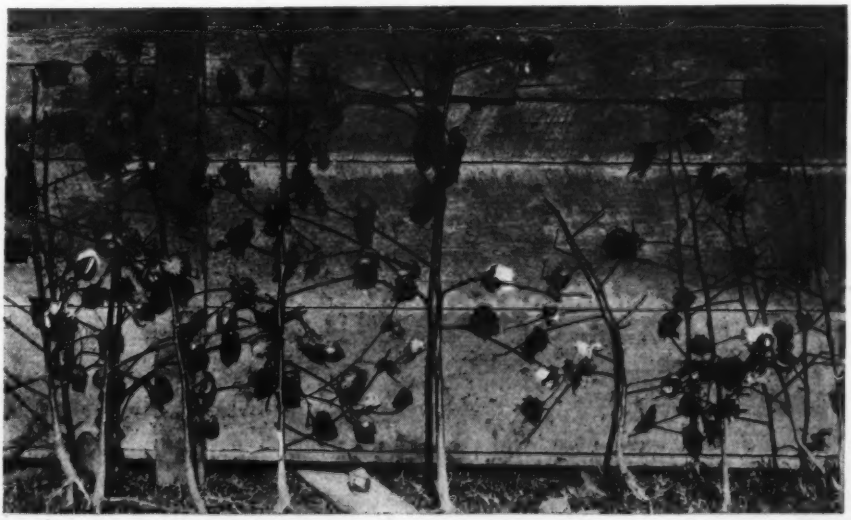
The six stalks at the left, fertilized with an 8-6-0, were attacked by wilt. The six stalks on the right were from the same field and adjoining rows, but were fertilized with an 8-6-8.



On the left are six average stalks of cotton from a field fertilized with 600 lbs. of 8-6-8; at the right six stalks from the same field and adjoining rows fertilized with 600 lbs. of an 8-6-0.

uses liberal quantities of nitrogen and superphosphate. Potash fertilizer cannot perform its full duty unless the proper quantities of these other plant foods are applied also.

The advisable thing to do is to use a properly balanced plant food in liberal quantities for the cotton plant. On soils where cotton wilts, where it rusts, and where the soil is cold and crayfishy, comparatively heavy applications of potash fertilizer are advised and will prove profitable, and we repeat that on almost all types of soil, three to four per cent of potash should be contained in the cotton fertilizer. In almost nine cases out of ten, even where these special reasons for heavy applications of potash do not exist, this amount will pay.



The same stalks as shown above with the leaves taken off to give a better comparison as to number and size of bolls. These are representative stalks, not the worst and the best.

FARM CONDITIONS

The General Situation as Shown by What the Farmer Does

By ARTHUR P. CHEW

United States Department of Agriculture

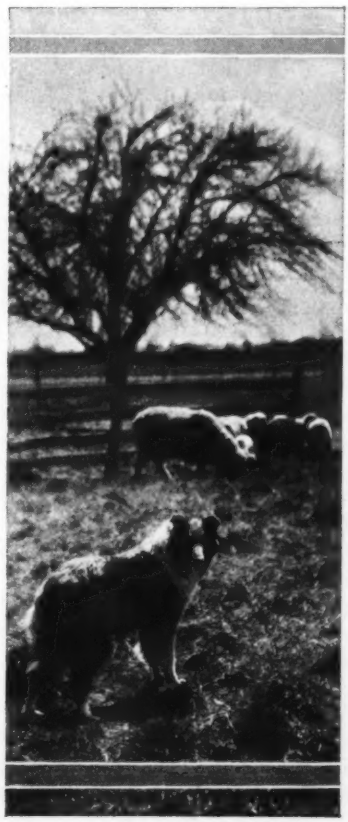
IN the farm-relief agitation period that was terminated by the decisive result of the national election, it was pretty hard to identify either the bona fide optimists or the bona fide pessimists about American agriculture. More often than not, the optimists turned out to be the opponents of the McNary-Haugen plan, and the pessimists its advocates. Men are naturally more impressed by evidence that favors their desires than by evidence of the opposite character. Hence, the farm-relief groups usually painted the situation black, while their adversaries painted it either not so black or fairly rosy.

This was an inevitable result of the controversy. On the one hand it seemed necessary, in order to justify the demand for radical innovations in agricultural policy, to represent the patient as sick enough to be in absolute need of such assistance. On the other hand the conservative viewpoint quite as inexorably insisted on the lack of need of heroic measures. All that is now history. The country has elected to accept farm relief by means not involving dumping or price control, and at the same time it has prepared to rid itself of prejudice in regard to the agricultural situation. For the first time since 1920 the condition of agriculture can be discussed without any implication that the scales are being weighted for or against any particular policy.

It is indisputable that agriculture has had hard going in the last few years. What we need to ascertain now is whether the outlook is good or bad. Is the patient getting better, getting worse, or merely holding his own? All sorts of evidence might be marshalled to throw light on the problem, did space permit. It would be pertinent to give statistics about prices and price relationships, about land values, about farm bankruptcies and foreclosures, about gross and net incomes, and so forth. Such data in general would show that American agriculture has made gains in commodity purchasing power while suffering declines in land valuations; that tenancy has increased since the slump of 1921; that the efficiency of agriculture has increased enormously; that net incomes have increased proportionately more than gross incomes in the last seven years, apparently as a result of a decline in unit costs of production, and that the earnings of agriculture are still not yet back to the pre-war level, when allowance is made for changes in the value of the dollar. But this material is capable of diverse interpretations. From the same facts one man will deduce a favorable and another an unfavorable conclusion, depending essentially not on the data but on his point of view. Information about the post-war loss of farm population to the cities, for example, will incline one person to think that agriculture is going to the dogs, and another to rejoice that it is producing

more food and fiber with less labor.

For the present, therefore, let us ignore prices and land values and income statements and purchasing power index numbers and so forth, and try an altogether different approach to the question. Let us adopt the method of the behaviorists, and endeavor to interpret the farmer's mind, not by what he or anybody else says about farming, but by what the farmer veritably does. Actions are usually a better index of beliefs than words. If a potato grower plants his seed by the light of the moon rather than by the light of science, you need no further proof that he is superstitious. If farmers as a group by their actions manifest faith in the future of their business, and at the same time give evidence that they do not lack the power to translate their faith into results, they can not change that proof of their real frame of mind by registering depression in public meetings and in petitions to Congress. The best possible evidence that American agriculture is not a moribund industry is to be found not in prices and income statistics, valuable though such evidence may be, but in what the farmers have done during the depression. It is appropriate, in short, to consult the record of their behavior. Specifically let us see what they have done about production, about acreage, about technical progress.



Agricultural production is less readily adjustable to market changes than industrial production. Sometimes farm output increases while demand slackens. For a time after the war American farm production continued to increase from the stimulus imparted to it in war time. Indeed, the increase was partly the result of an effort to compensate for low prices by large production. Eventually, however, agricultural production obeys the law of supply and demand. When the output steadily and materially increases, the inference is that the industry is responding to economic rewards either current or prospective. In the 10 years since the world war ended, American farm production has greatly increased despite a sharp decline in the number of farm workers. Crop production in the period of 1922 to 1926 was nearly five per cent greater than in the period 1917 to 1921, and the output of animal products increased fully 15 per cent. Such facts are utterly inconsistent with the notion that our agriculture can not prosper without making a present of its surpluses to foreign nations.

In 1928 the acreage of crops harvested was the largest on record. The area harvested of 19 principal crops was 357,400,000 acres, compared with 349,554,000 acres in 1927. Acreage of crops not included in this total increased in about the same proportion. The previous high year was 1919, when the acreage in the 19 principal crops was 351,209,000. For each year in-

tervening between 1919 and 1928 the acreage of the 19 crops was less than in 1919. In the case of many crops annual variations in acreage are as important as annual variations in yield in determining variations in output. The 1928 acreage, whether well-advised or ill-advised, was clearly a mark of confidence among the farmers in the future of agriculture. It was a positive indication that the men engaged in the business of farming have not thrown up their hands in despair.

In the South

Consider what is doing in the cotton fields. In 1926 cotton was planted on an area of nearly 48,000,000 acres, compared with only 33,000,000 acres in 1922. It is well known that this increase in the area planted to cotton was largely the result of the adoption of large-scale methods of cotton growing in Texas and Oklahoma. In 1926 the large area planted, coupled with high yields, produced a record crop and the price sank to an extremely low point in the early marketing months, whereupon a cry of distress went up from the Cotton Belt. Farmers got together to reduce their cotton acreage, and the next year they did reduce it. In 1927 the output of cotton was cut down by acreage reduction, boll weevil damage, and the Mississippi floods. As a result, the price advanced.

Immediately the cotton grower's heart rose once more, and he prepared again to grow more cotton. In 1928 cotton was planted on about 46,700,000 acres, an increase of 11.4 per cent over the acreage planted to cotton in 1927. The area in cotton was only 4 per cent below the record acreage of 1926. This expansion might have produced another collapse of cotton prices had Nature seconded man's efforts to produce another large crop. But the boll weevil was active and weather conditions were not good. As a result, the output of cotton was only slightly more than 14,000,000 bales. This quantity was consistent with reasonably good prices, and the income from cotton in the 1928-1929 season promises to be satisfactory. That, however, is not the point for the moment. The point is that cotton growers of the United States, at the slightest encouragement, are prepared to increase their production. They are not scared, but optimistic. Perhaps they ought to be more cautious, but the fact remains that expansion rather than contraction is the normal order of the day in the cotton States.

On the Great Plains

The same thing is going on in the Great Plains region. Since the war the cultivated area in the six principal Great Plains States, namely the Dakotas, Nebraska, Kansas, Oklahoma, and Texas, has greatly increased. As a matter of fact, the increase was continuous throughout the depression period. In the three-year period 1925 to 1927 the average area of the principal crops in those States was more than 8,000,000 acres greater than in the three-year period 1919 to 1921. Texas had an expansion of nearly 5,000,000 acres; North Dakota and Nebraska had an expansion of about 1,000,000 acres each, Kansas, South Dakota, and Oklahoma accounted for the remaining million. Montana expanded its cultivated area about 1,000,000 acres, and Colorado about one-half million acres. Another million acres were added to the country's cultivated area by Minnesota. Conditions have not been altogether satisfactory for the farmers in these States during the depression period. As a matter of fact, some of the States in question have had an exceedingly high bankruptcy rate and much distress. Yet agriculture forges ahead in that whole region. Are we to conclude that it does so because the farmers concerned are unwise, or because they know what they are doing?

A field of spinach, ready for the canning factory, on an Indiana farm.

America's leading agricultural enterprises are cotton growing, wheat growing, corn and hog raising, and beef raising. These enterprises have had their share of depression since the war. But they refuse to stay depressed. Cotton, as already mentioned, was grown in 1928 on an area only slightly below the record area of 1926. Wheat in 1928 was produced in a volume exceeding 900,000,000 bushels for the first time since 1919. The inspected slaughter of hogs in the hog crop year ended October 31, 1928, was 47,800,000, the third largest on record. It was 11 per cent larger than that of 1927 and 17 per cent larger than that of 1926, though smaller than the slaughter in 1923 and 1924. These evidences of economic energy can not be brushed aside by calling the farmers who manifested it ignorant or ill-advised. Certainly the expansion of farm enterprises is not always followed by satisfactory financial returns. In 1928, for example, the Department of Agriculture specifically advised against expanding the acreage of certain classes of wheat and of potatoes. This advice was not generally heeded, and incomes from grain and potatoes were considerably lower than in the previous year. In the long run, however, production can not be expanded unless the market justifies expansion. American agriculture since the war has expanded its production because that course, despite relatively low prices, has not been vetoed by the economic forces of the world. On the contrary, it has been indorsed. An expanded world demand, coupled with increasing facility in production, is the source of the optimism which our farmers show by their actions if not by their words.

Efficient Production

American agriculture derives its principal justification for increased production from its rapid technical progress. It should not be forgotten that conditions which may dictate reduced production for agriculture throughout the world may nevertheless be compatible with increased production in favored areas, or under exceptional technical conditions. This country has unsurpassed agricultural resources, and it has no superior in agricultural production per unit of labor involved. On this basis our wheat growers and cotton growers may be entirely justified in forging ahead in production without paying over-much attention to the balance of production

and demand throughout the world. They may feel confident that in the comparative struggle for a restricted demand, the best way to insure their own ultimate advantage is to do battle with producers elsewhere. They have pretty good weapons. Their slogan is: When contraction is necessary in agriculture, let our foreign competitors do it.

Watch the Market

The American farmer can stand difficult price conditions as well as any of his competitors. In the three crop years 1924-1925, 1925-1926, and 1926-1927 the farm price of wheat in this country averaged $1.28, $1.46, and $1.23, respectively. This year it will probably average lower. In relative purchasing power wheat has averaged lower during the last few years than it did before the war. Nevertheless our production has been maintained and in some States greatly expanded. This is evidence that our wheat growers enjoy an advantage in the world-wide competition their business faces, and the source of that advantage is not far to seek. It is chiefly the result of accelerated mechanization—the use of trucks, tractors, combine harvesters, and so on. Combine-harvesting, which reduces the labor requirement of threshing by some 75 per cent, has swept eastward from the Pacific slope like a prairie fire in the last decade. It explains why increased world production of wheat does not frighten the American grower. When the situation finally requires a reduction of acreage, he may let the reduction take place on foreign farms less well equipped than his own.

As proof that increasing production is really a sign of vigor and progress in agriculture, we may point to the fact that the American farmer does not practice it always and everywhere. He does not persist in increasing his output in circumstances that make that course profoundly inadvisable. At all events he does not make that mistake year in and year out, although each season furnishes examples of erroneous expansion. The beef industry illustrates the point in question. In the post-war depression the beef industry suffered severely. Did the beefmen keep right on producing in the blind faith that it is a long lane that has no turning? They did not. Between January 1, 1918, and January 1, 1928, the production of beef in the United States was curtailed to such an extent that the number of cattle in the country was reduced by 15,500,000 head, or about 22 per cent. Today, although the population is 23,000,000 greater, the country has no more beef cattle than it had in 1913. As a result, beef prices are high, the beef industry is looking forward to several years of prosperity, and the trend of beef production is turning upward.

Trend Is Upward

The trend of production in agriculture is a pretty good index of its basic conditions. Note, however, that the important thing is the *trend*, not the output of a single year, which in the case of field crops may be greatly influenced by yields per acre. Sufficient evidence that the post-war basic trend is upward has been given. It may be well to supplement the figures above quoted concerning the comparative output of the period 1922-26 with that of 1917-21 with the estimated figures for 1928. In field crops for 1928 the production was about five per cent greater than in the preceding year, and the output of certain classes of livestock increased also. This information, however, is scarcely necessary to show that the depression has not curtailed production. That admits of no question. Only in regard to its meaning may controversy arise. The contention of the writer is that the post-war expansion of agricultural production is at once

(*Turn to Page 56*)

¶A *novel way to bring farmers to see a demonstration.*

A Shucking Contest

By W. H. Byrne

Virginia A. & M. College

A MAN small in stature, yet rugged and alert, is Carroll Herndon. It could be seen from his actions as soon as he started that he was a dangerous man to his opponents. They watched him carefully, but before the contest was over he had shaded all of them by shucking nine and one-third barrels (46½ bushels) of corn in six hours of actual shucking time. His closest opponent shucked slightly more than seven barrels (36.9 bushels), and the average of the five winners was only 7.6 barrels (38 bushels).

The contest is probably the first of its kind held in the State of Virginia. The idea originated with County Agent E. V. Breeden. Thirty-five men and women were present during the contest and saw the judges measure the corn. The corn was shucked from the shock and the contestant was not allowed to tie the fodder so that the judges could examine it carefully to see if any ears were left.

The main purpose of the contest was to have the farmers of the community see the results of a fertilizer demonstration on corn carried on by Ed. Ester, a farmer living near Orange, Virginia, in cooperation with County Agent Breeden, the results of which were very convincing.

Carroll Herndon.

The demonstration consisted of a six-acre field of corn. The field was measured and divided in half. The entire field was limed at the beginning of the rotation and before planting one of the three plots received 300 pounds of 16 per cent superphosphate per acre, broadcast with a drill. The yield on this three acres was 151½ bushels, or 50½ bushels per acre. The other three acres received an application of 200 pounds of nitrate of soda, 300 pounds of 16 per cent superphosphate, and 67 pounds of muriate of potash per acre. This three acres

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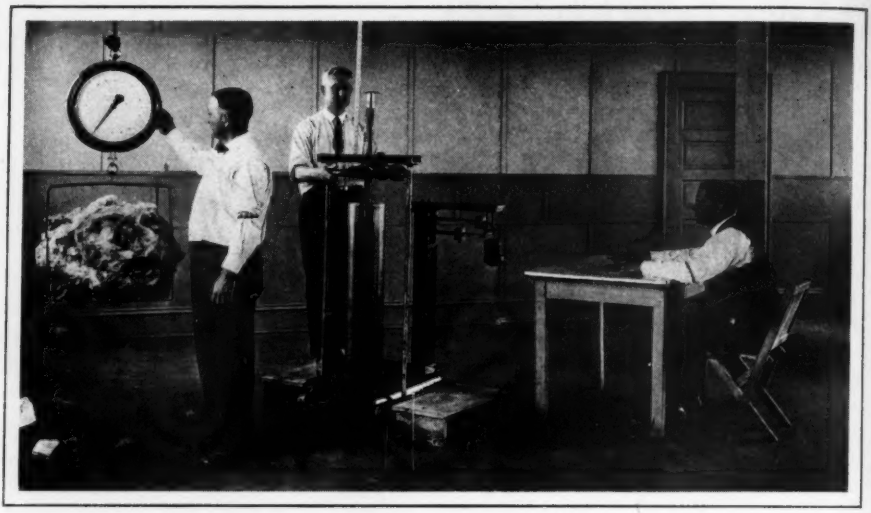


Weighing and compressing fleeces at the United States wool laboratory.

Agriculture Today

II. ANIMAL HUSBANDRY

By Frank George

CHANGED economic conditions are having a far-reaching effect upon animal husbandry organization and breeding methods. The need for lower production costs and the consumer demand for lighter weight cuts of meats are emphasizing more rapid turnover in the livestock industry in the production of lighter weight steers, bacon-type hogs, and sheep which yield a profit on both wool and mutton.

In the beef cattle industry, according to Dr. J. H. Mohler, Chief of the Bureau of Animal Industry, the requirement is for the 1,000-pound steer produced within two years on relatively high priced feeds, as contrasted with the 1,500-pound steer grown in five years on grass, hay, and other roughage. This calls for the keeping of more breeding cows of high quality, early maturing type, and good conformation. Fifteen hundred pounds of dressed three-year-old beef represents the product of two steers which require three cows to produce, whereas an equal quantity of yearling beef represents the production of nearly five beef cows.

"The problem of the cattle raiser," Dr. Mohler declares, "is to find practical low-cost methods of production and at the same time to turn out a product of such uniform high quality that the consumer will be willing to

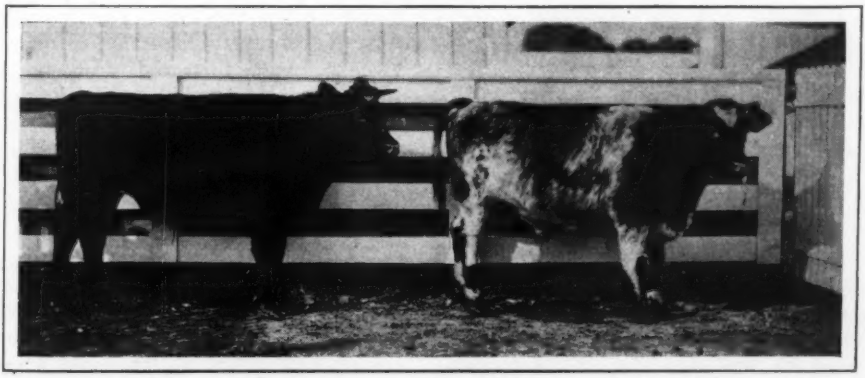
pay prices which will mean a fair return." The day has passed when cattle producers were not especially concerned over how long their cattle remained on range. Range was cheap and so long as land values went steadily higher, there was no economic pressure for rapid turnover in the livestock enterprise. But with the cessation of steadily mounting land values, it became necessary to look to the livestock as the chief source of profit.

In the opinion of livestock marketing specialists there will always be a demand by hotels, restaurants, and dining cars for heavy beef, and so long as this demand is not over-supplied, heavy cattle will sell for more than light cattle. Another angle to the situation is the utilization in this "hot dog" age of considerable quantities of old stock in the manufacture of delicatessen products. However, the bulk of the household demand is for the four to five-pound roasts as compared with the six to nine-pound roasts of former days.

At Sni-a-Bar Farms, Grain Valley, Missouri, the Bureau of Animal Industry is making studies of low-cost methods of production, by making comparisons between calves allowed to run with their dams on grass without additional feed, calves with dams on grass and allowed grain fed within creeps, and calves kept on separate pasture from dams with access to grain and allowed to nurse twice daily. A national research project is also under way to discover the factors which make for uniform high quality in beef.

Federal inspectors making ready to go into disease infected livestock areas.

Similar changes have come about in the sheep industry. Whereas most of the sheep slaughtered formerly were from four to eight years of age and were mostly of merino or fine-wool breeds, the demand now is for a carcass ranging from four to twelve months of age. Lambs of this age now make up at least 80 per cent of the market supply of all sheep. They come mostly from the mutton-type breeds or crosses between the wool and



First-cross steer at left. The second-cross steer at the right has greater depth of body and a blockier form.

mutton types.

"The chief problem of the sheep industry," Dr. Mohler says, "is to secure the utmost advantage from the two crops which a sheep produces each year—lambs and wool. To do this, sheep must be selected for breeding purposes both on the basis of their mutton qualities and the character of the fleece. That one crop must be sacrificed if the other is to be improved, is not necessarily true. For example, the average weight of fleece sheared from American sheep today is approximately four times that of the sheep grown in this country in 1840. And yet, the better-fleeced sheep of today is also a better-muttoned sheep. The heavier and higher quality fleece has gained in conjunction with a better leg of mutton."

The Bureau of Animal Industry has developed the Columbia type of sheep to meet the modern demand for emphasis on both wool and mutton. Though not yet absolutely fixed in type, this sheep after 15 years of development is showing less variation each year. The ewes are very prolific and consistently yield long stapled fleeces of one-quarter blood quality. Under range conditions the fleeces will average over 11 pounds, and the lambs at weaning time will weigh 78 pounds. During a recent year the bureau's Rambouillet flock returned $10.16 per ewe, the Corriedales $10.28 per ewe, and the Columbias $11.34 per ewe, considering the lambs worth 10 cents a pound and the wool 50 cents a pound.

Better Lambs

The bureau, in its studies of the factors influencing the quality and palatability of lamb meat in cooperation with a number of State experiment stations, is endeavoring to aid sheep men in producing the kind of a handy-weight market lamb in greatest favor in this country. It is endeavoring to ascertain, also, in its cooperative wool studies, what methods of breeding, feeding, and management will obtain the greatest quantities of high-quality clean wool.

Consumers want lean bacon, small hams, and more fresh pork than formerly. Producers, instead of keeping hogs until they are a year to a year and a half old, are forced by economic pressure to secure more rapid turnover by shortening the production period and marketing hogs at from eight to ten months of age. Stress is being laid on the production of larger litters, inasmuch as the relative profitableness of a hog enterprise corresponds closely with the number of pigs weaned and marketed per sow.

More Pigs

A study made of 51 droves of spring pigs in Iowa and Illinois in 1921 showed that droves weaning less than three pigs per sow had an average pig cost of $8.13, while those weaning seven pigs to the sow showed a cost of $3.35 per weaned pig. The one important cause of this wide variation in the cost of weaned pigs, Dr. Mohler says, was the death losses in some droves, due in many instances to the careless management and feeding of the breeding herd. A total of 340 in every 1,000 of the pigs farrowed were lost before weaning time. More little pigs were killed by the mother sow lying on them than by any other cause. A simple guard rail in the farrowing house would have eliminated most of this loss. The fact that fifty pigs in every thousand, or one in twenty, were farrowed dead or so weak that they could not stand up to suckle indicates that the selection of sows and their feeding and handling before farrowing are important factors in the health and vigor of the offspring.

"As the cost of feeding and caring for the sow throughout the year must be borne by her offspring," Dr. Mohler points out, "it follows that those sows whose litters are large and whose

(*Turn to Page* 57)

These youngsters raised 100 bushels of potatoes on ¼ acre. Left to right: Malcom Troutman, David L. Fawcett, Charles Tierney (highest yield), Robert Malcom, Earl Emmons, and Ethel Powell; (2nd row) W. B. Ward, Purdue University; P. O. Hurley, B. & O. Railroad; and Jesse A. Wood.

A 100-Bushel Club

By Jesse A. Wood

County Agent, Martin County, Indiana

FOR the past six years Martin county, Indiana, and the Baltimore and Ohio Railroad have been cooperating in Potato Club work. They started six years ago with 12 members and this year had 82 boys and girls from 10 to 20 years of age engaged in raising ¼ acre of potatoes.

This year 74 of these members finished their project and exhibited a peck of potatoes at the local show and at the Indiana State Fair. Six of these 74 members raised more than 100 bushels per ¼ acre, with an average yield of 110 bushels, the high yield being 117.9 and the lowest 100.7 bushels.

The average total cost of production was $26.68 per ¼ acre or 24.2 cents per bushel. The lowest cost per bushel was 18.4 cents, when 51 man-hours of labor were used, or a total cost of $21.80. The highest cost per

(*Turn to Page* 59)

Mr. Barton and a part of his family of twenty.

L. R. Barton, *Optimist*

By H. N. Wells

County Agent, Sullivan County, New Hampshire

"THERE is a better opportunity in farming now for young men and women who really want to farm and are willing to work than there was 34 years ago when we went to farming," said Mr. and Mrs. Lemuel Barton of Sullivan county, New Hampshire, in a recent interview with the writer. "Prices are much higher, there are better markets, better transportation and better organization for handling products than back in 1894.

"Take milk, for instance. We sent it to Boston and got around three cents a quart, and now it brings from six to eight cents. Thirty-four years ago we sold a 10-pound turkey for a dollar, and today it will bring from five to six dollars. Maple syrup, one of our big sources of income, sold formerly for ninety cents to a dollar and today the best brings around $2.50 a gallon. Dairy cows and meat stock are also selling well. In fact, all livestock and crops have advanced very materially since those times.

"Of course, costs of production and our living have gone up too, but a farmer who will devote his time to his work can make a good living and lay something aside. There has got to be still more adjustment, for even with higher prices, there is too much difference between the price we get for our products and what we have to buy."

Mr. Barton was born 61 years ago on the old Barton farm on the Goshen

road, two miles south of Newport, New Hampshire. In 1893 he married his good wife, now 51 years of age, and to them has come a wonderful family of children. There are 20 in all, 10 boys and 10 girls, all in good health, the oldest being 34 and the youngest five years past. They are rugged, thrifty boys and girls such as are usually found on the farm, and are a credit to the community in which they live.

Their names are Addie M., Nellie F., Levi M., Jennie A., Lucy M., Cloie B., John L., Fred R., Josea R., Clark K., George A., Alice B., Ella R., Charles M., Franklin E., Edwin C., Orrin O. C., Emma A., Paul Andrew, and Dora H.

Every one has arrived singly, there being no twins or triplets. Four of the older children are now married, and collectively have seven children of their own. The nine youngest children are still at home where they help with the work when not in school. Three of the children now attend the local district school; three are in Junior High; and three are in the Senior High School. Those in Junior and Senior High rattle out early in the morning and leave home about seven, either by bus or bicycle for town four and one-half miles away. Some of the older children have already graduated from high school.

Mr. and Mrs. Barton are farmers of unusual thrift and judgment, or they could not have raised the large family they have and at the same time accumulated the property they now have.

Lemuel R. Barton.

"When we started farming after we were married," said Mr. Barton, "we had less than a thousand dollars to invest in land, buildings, farm equipment, and livestock. Thirty-five years ago we bought the home farm of 100 acres; later added 20 more; bought another farm of 150 acres, principally for the wood and timber on it; and later a pasture of 26 acres; making 296 acres in all that we owned up to 10 years ago. We have always practiced general farming, keeping six to ten dairy cows, making butter to be sold at retail, and have raised the necessary feed for them in so far as we could. There have also been some potatoes and apples to sell, and

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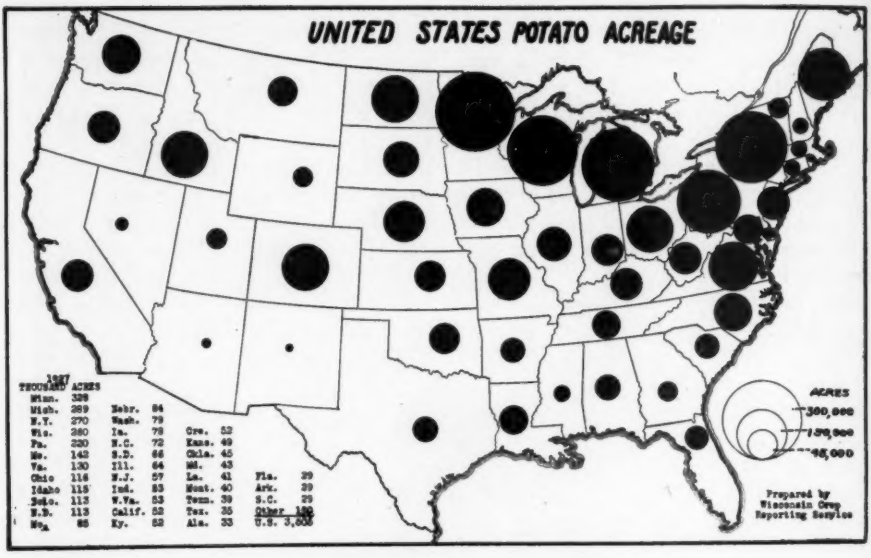


POTATOES

¶ *First of a new series on crop statistics*

By Walter H. Ebling

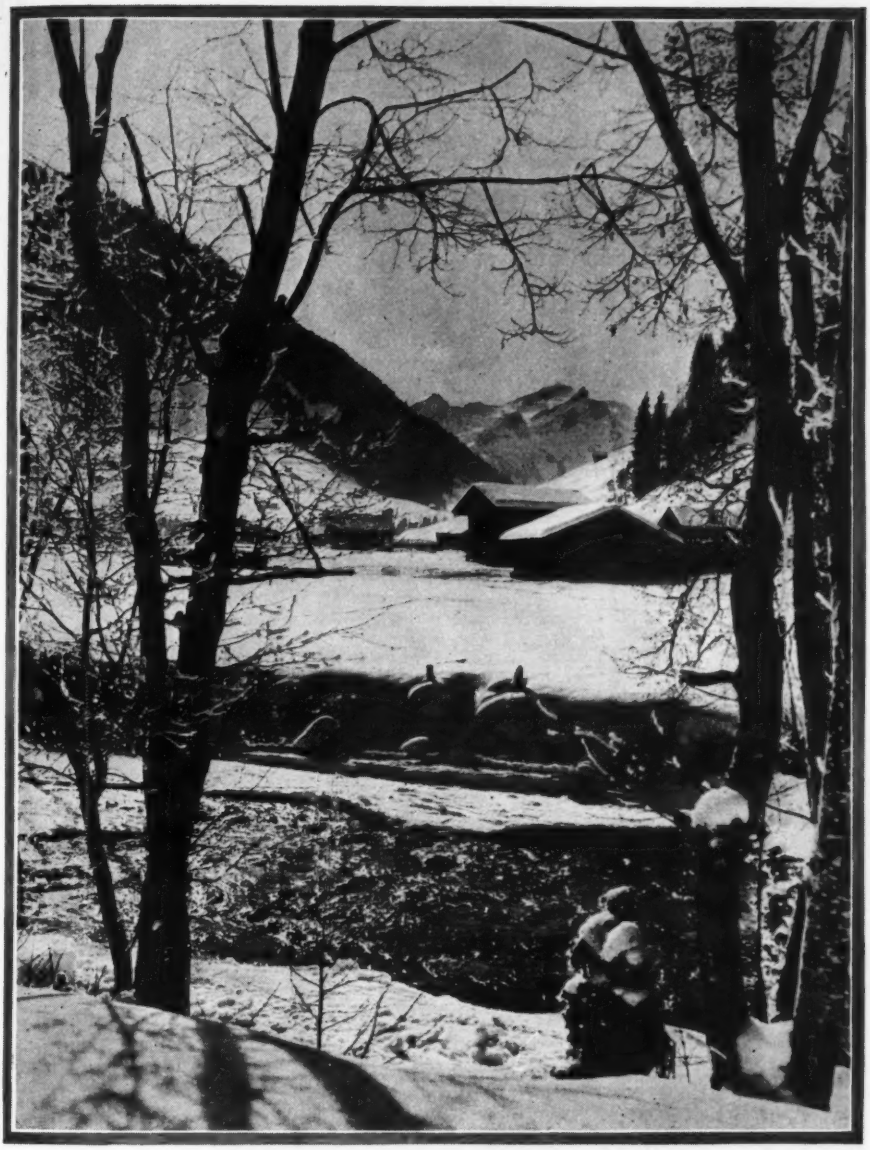
Agricultural Statistician, Wisconsin

SINCE the discovery of America by Columbus, most civilized white men have learned to eat potatoes. Indeed, in some countries of Europe, the potato has become almost as important an item of food as has rice in the Orient.

The crop came originally from the Andean mountains of South America. It was cultivated as a food by the natives on that continent before the white men came. Its introduction to Europe revolutionized life and food habits and brought about one of history's most spectacular population increases. So dependent did some countries become upon the potato as a food, that, in years of a poor potato crop, serious famines occurred. This is especially true of Ireland where the potato became a most important food item. So general was the use of the potato as a food in Ireland, that this originally American crop is very commonly referred to as the "Irish Potato."

This crop the world over shows a preference for regions having a cool climate with fairly uniform tempera-

(*Turn to Page 54*)



The keen, clear air—the splendid sight—
We waken to a world of ice,
Where all things are enshrined in light,
As by some genii's quaint device.

—Andrews Norton

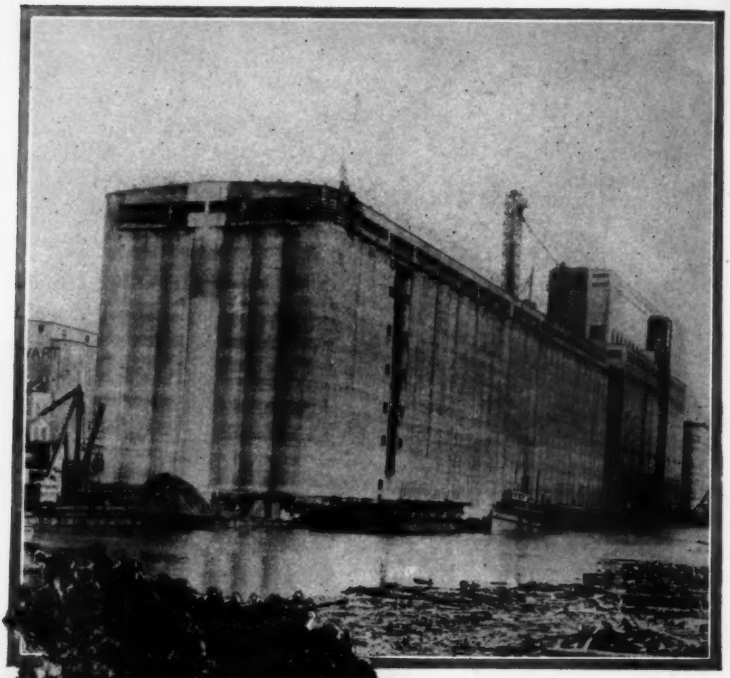
PICTORIAL

Waiting for his Christmas dinner.

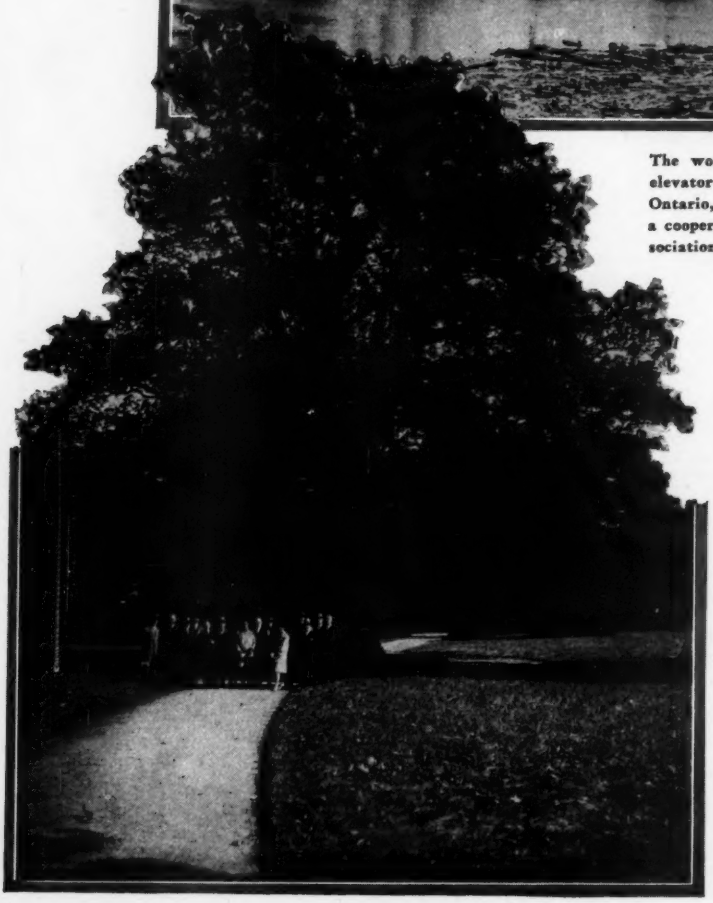
First come first served.

A great gift for an active youngster.

A barrel of pork.



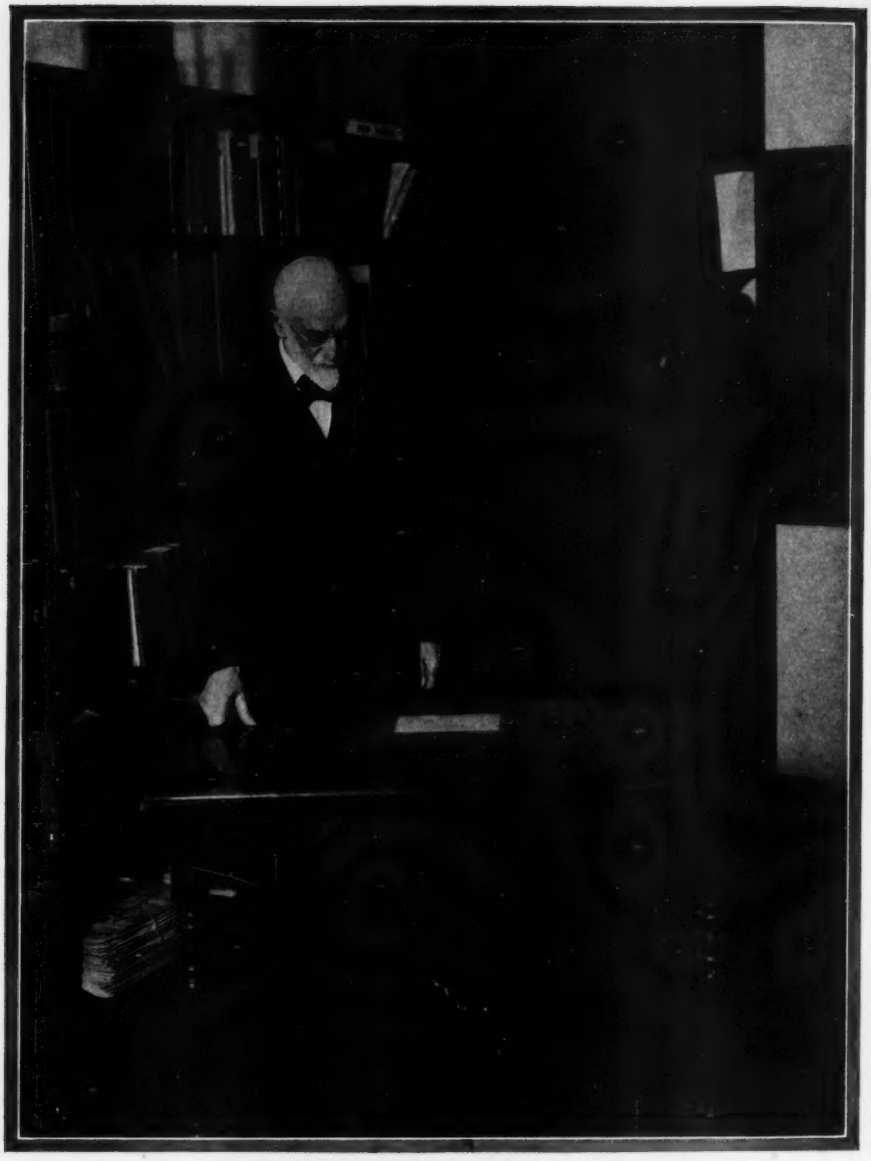
The world's largest wheat elevator at Port Arthur, Ontario, Canada, owned by a cooperative marketing association of Saskatchewan farmers.



A German oak tree 1,000 years old.

These are not footballs nor balloons, they are lemons grown by Mrs. Charles A. Massie at Ball, California, so big that they weigh two pounds apiece.

The smallest purebred Shorthorn cow in the world, owned by Theo. J. Tegelar of Nebraska. This midget stands 39 inches in height and is 7 years old. On the cow are Tegelar's two children, Doris and James.



DR. STEPHEN MOULTON BABCOCK

While Professor Stephen Moulton Babcock, known the world over as the modest inventor of the great dairying test which bears his name, is not a collector of antiques, he does thoroughly enjoy re-examining this service-battered and time-worn table. Its story is best told by the legend which Dr. Babcock is reading. Here it is just as it was penned by Professor W. A. Henry, the first dean of the Wisconsin College of Agriculture and director of the pioneer experiment station established in connection with that institution.

"The agricultural department of the University of Wisconsin under my direction was first housed in the 'University Farm House' in 1880. In 1881, my wife and self occupied three rooms, the other being given over to the farm help. I started the form of an office by purchasing this table for $2.50 and placing it in the front room, second story of the farm house. This table may be regarded as the first and oldest piece of furniture belonging to the College of Agriculture." W. A. Henry, Madison, Wis. July 30, 1907.

The Editors Talk

In Retrospect

The year 1928 started out with as bright an agricultural outlook as there has been since the war. Crop and livestock prices were favorable enough to lead farmers to increase their plantings and livestock holdings.

A long, cold spring somewhat dampened this outlook. This was particularly true in the case of cotton, corn, tobacco, and potatoes. Nevertheless, in spite of the weather, greater acreages of these crops were planted.

Coming along to the growing season, unfavorable weather caused considerable depreciation in crop quality, especially along the Atlantic Seaboard where tropical storms damaged the cotton and tobacco. On the whole, however, the season was favorable, with the result that the production of crops in 1928 was greater than in 1927.

As this increased production has come upon the market this fall, farm prices, naturally enough, have reacted and declined. However, they have not declined to the low level which occurred in the spring of 1927.

The price of cotton has been considerably below that of last year. This holds true also of tobacco, potatoes, corn, and grain. Yet, even though the prices of these crops are not as favorable as last year's, agricultural prices as a whole are a lot better than in 1927.

Farm prices this year have averaged 45 per cent above prewar. During 1927, they averaged 37 per cent above, and in 1925, 54 per cent above, so that in comparison, this year's prices are better than in 1927, but not as good as in 1925.

The fertilizer sales during this year have been decidedly greater than in 1927. This would indicate that in spite of the fact that the chief fertilizer crops —cotton, tobacco, corn, and potatoes have brought lower prices in 1928 than in 1927, farmers in general are optimistic.

As further evidence of this optimism, we would refer our readers to the article on farm conditions as shown by what the farmer actually does, appearing on page 18 of this issue, and written by Arthur P. Chew, of the United States Department of Agriculture, well-known writer of economic articles. Mr. Chew believes, in line with the above, that 1928 is clearly a mark of confidence among the farmers in the future of agriculture.

Agricultural Workers Meet

During the week of November 19 to 24, more than 500 of America's leading scientists assembled in Washington to discuss problems of vital interest to American farmers.

Three groups of workers were represented at these meetings: The American Society of Land Grant Colleges, the American Soil Survey Association, and the

American Society of Agronomy. All of these groups focussed their attention on the fundamental problems and ills of agriculture, and endeavored to show that if conditions are to be greatly improved, science must assume a more aggressive role. This is a most commendable attitude since agriculture is looking more and more to science for a solution of its problems.

Of particular interest were the symposiums on "Soil Organic Matter and Green Manure," "Application of Base Exchange Methods," "Lime," "Soil Erosion," and "Tobacco Research," sponsored by the American Society of Agronomy.

The program of the American Soil Survey Association was confined largely to discussions of the relation of soil types to crop adaptation, to crop infestation with special reference to the corn borer, soil erosion as a national problem, soil survey, to timber production and forest policy.

Judging from the interest manifested in the scientific papers presented and resultant discussion, it is quite evident that the soil has always been, is now, and is likely to remain, the basis of a permanent agriculture and, therefore, of our civilization.

Publicity and Lime

The use of lime has become so wide-spread and common that we may be prone to overlook the comparative youth of the extensive adoption of this practice. It is true that liming has been practiced to some extent since early historical times in European and Asiatic countries, and in this country for about 150 years. However, the general use of lime dates from around 1900. Since that time the consumption of this material has increased by leaps and bounds.

The rapid increase in the use of lime is due to the fact that it was profitable, and particularly to the wide publicity that has been given to the benefits derived from the use of this material. One is impressed with the volume and extent of this publicity and the results secured, when reading Dr. H. J. Wheeler's article "Results of Publicity as Measured by Lime Sales for Agriculture" in Rock Products for September 15, 1928. Dr. Wheeler lists by experiment stations the publications issued on lime, together with the apparent effects of these publications, as measured by increased lime consumption.

A few selected instances illustrate the value of these publications. In Kentucky, 60,000 tons of lime were sold in 1923, while 132,000 tons were sold in 1927. In Pennsylvania, twice as much lime is used now as was used when a special experiment on Volusia soils was begun. The consumption in this state is about 400,000 tons a year. The first carload of lime is reported to have been sold in Illinois in 1902. In 1906 there were 122 tons used, in 1916 there were 113,000 tons used, and in 1927 there were 718,000 tons used. Many other states reported similar trends. Such astounding increases in the use of lime speak well for the benefits that accrue from it and for the effectiveness of the publicity.

It should not be thought that the experiment stations were alone in presenting the story of lime to the agricultural public. Many railroads gave effective cooperation by using publicity material and by running agricultural trains over their lines. They also have hauled lime free on their roads, in order to introduce its use into certain sections. These practices, of which Dr. Wheeler mentions several, result in benefits for both farmer and railroad. The in-

creased use of lime has made more profit for the farmer and more hauling for the railroad through the bigger and better crops grown, aside from the increased railroad business of hauling the lime to the farmer.

The agricultural press and literature of the fertilizer companies have certainly played an important part in this educational campaign. They have served to spread widely and quickly the teachings of the experiment stations. Last, but not least, we have the publicity of the lime industry itself.

Thus, we have a great mass of educational matter being spread, and a most favorable response has come from it. However, the task is not completed. There are yet many acres of land that could be made efficient for crop production if they were limed; and we have other acres that do not receive lime frequently enough, or in large enough quantities.

It is very fitting that Dr. Wheeler, who is now manager of the Agricultural Service Bureau of the American Agricultural Chemical Company, should have made this comprehensive survey of lime. During his long and successful service as Director of the Rhode Island Experiment Station, he was one of the outstanding pioneers in the investigation and use of lime. He modestly makes only a passing reference to his own work, but it has been truly great. Much of the investigational work of the country on the principles and practices of liming was inspired by the work of that notable quartet—Wheeler, Frear, Hopkins, and Thorne. The fruitage of their labors is seen in the thriving fields of alfalfa and clover one sees on all sides of the country.

The Potash Industry

A very important day in European agriculture is Potash Day held in Berlin. Guests of the occasion are offered an unusual opportunity to review the latest developments in this phase of the fertilizer industry.

The seventh of these Potash Days, held on the 30th of last January, assumed an international significance in calling together as it did such well-known agriculturists as Professor Dr. A. Binz of Berlin; Geh. Hofrat Professor Dr. Paul Wagner, Darmstadt; Sir John Russell of Rothamsted; Professor Dr. Ulrich Duerst of Bern; Professor Dr. Neubauer of Dresden; and Professor Dr. H. Kappen of Bonn Poppelsdorf, as speakers.

Among the guests, the names of many leading scientists from other countries were found. The presence of professors of American and Japanese universities revealed that interest in the consumption of potash is by no means restricted to the European continent.

With this widespread interest in mind, we are calling the attention of our readers to the following abstract of the inaugural address by Dr. Gerhard Korte—

"At the first six 'Potash Days' held in the years 1906 to 1912, the lectures dealt primarily with geological, chemical, and technical questions. As milestones in the development of the potash industry, the second and sixth Potash Days with the outstanding contributions by van t'Hoff and Svante Arrhenius deserve special mention. The seventh Potash Day on the other hand is dominated by the idea of the importance of the potash industry as an important factor in food production, and is devoted, therefore, to the use of potash salts in agriculture.

"Nine-tenths of the potash salts produced annually are used for agricultural purposes and are, therefore, important raw materials for the most vital of all industries; only one-tenth of the output is consumed by the chemical and allied industries.

"Expressed in round figures, approximately 5 million tons of potash salts serve annually to promote the growth of grain and root crops and thus to help materially in the production of our daily bread. These potash salts, which so many thousands of busy German hands raise from the bowels of the earth, are returned by the farmer to the soil to build up the substance of the plants.

"Hence the potash industry constitutes a unique link between industry and agriculture. This characterizes its significance as a promoter of the world's food supplies.

"The main task of the potash industry is consequently to aid in increasing food production and at the same time to enable the farmer to grow his crops at the lowest possible cost.

"The maintenance of such low prices has only been made possible by a most rigorous rationalization of the industry such as probably has never been undertaken by any other concern. A large number of mines have been closed down and production thus confined to the most efficient works, which have been enlarged and modernized.

"Germany's aggregate output of potash salts supplies three-quarters of the total demand of the world for potash. In amicable cooperation with the French potash interests the German potash industry helps in supplying 19/20 of the entire world-demand for potash.

"The understanding existing between the French and German potash interests, aims above all at cooperative scientific research. This research work shall be conducted on scientific agricultural lines throughout the world, as has been the case for many years in Germany."

Fertilizer Economics

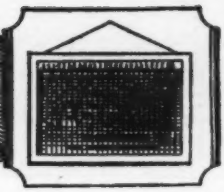
In recent years, considerable work has been done in the field of agricultural economics and statistics. In line with the advance in this science, Better Crops Publishing Corporation is now printing and distributing a new 8-page pamphlet called *Fertilizer Economics*.

The information contained in this new publication is designed to give a clear picture of important price indexes as they relate to fertilizer consumption in the United States. It is believed that this is the only source of such complete and authoritative data now available to buyers of fertilizer material, economists, financial editors, bankers, agricultural workers in economic fields, and others. The data are complete for 31 years, 1897 to date. They are useful in showing important trends and price changes.

These index numbers were made under a fellowship established in the Department of Agricultural Economics and Farm Management of Cornell University, in 1926 and 1927. Dr. E. E. Vial who did the original work is keeping the data up to date and is editing each issue of the booklet, *Fertilizer Economics*.

We shall be glad to send a copy of this publication to any one interested.

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

WHAT MORE SNUFF?

Although the once numerous official snuff boxes in the United States Senate have dwindled to one lone container, presumably patronized by one lone Solon, the consumption of this old-time tickler has been increasing in this country during the past half century. Fifty years ago our consumption was about 4,000,000 pounds annually, while now, official reports say, we use about 41,000,000 pounds. It is estimated that approximately one-fourth of the population is addicted to the stimulant which, by the way, is made of high-grade dark fire-cured tobacco of Virginia, Kentucky, and Tennessee. Snuff is said to be of better quality than it used to be in the early days of its manufacture in France and England when refuse and scrap were used. Modern users here are predominantly persons in industries where smoking is prohibited, southern laborers, and immigrants from countries where snuff using is a widespread habit.

SCORE TWO FOR MERCURY

In his struggles against a host of direct and indirect enemies man has found mercury one of his most useful weapons, and the years are adding new uses, some of them conspicuous in increasing crop production. After four years of research at the University of Illinois, Dr. Benjamin Koehler has found that ethyl-mercury-chloride dust is much more successful in controlling oats diseases than the old standard formaldehyde treatment. Crops from seed receiving the new treatment have shown increases nearly twice as great as those produced by the formaldehyde treatment, the reason given by Dr. Koehler being that the mercury compound not only gave perfect smut control but also checked other diseases including seedling disease caused by infection from the soil. Seed oats can be treated for a cost of about 10 cents a bushel for the material. One commercial concern is making the compound under the name of Ceresan.

Progress in the control of the "damping off" disease of sugar beets by the use of mercury compounds on the seed is announced by the Wisconsin College of Agriculture. This disease, thought to be caused by fungi, is especially bad where sugar beets are grown with truck crops, but where the beets are grown on dairy farms the trouble can be greatly reduced by proper rotations. The Wisconsin scientists hope soon to be able to recommend a specific treatment.

Successful dust treatments have been available for some time for the treatment of seed corn and seed wheat.

"COUNTERFEIT" CALVES

Good baby beef may be produced nearly as efficiently on Wisconsin dairy farms as on beef cattle farms of the corn belt, according to J. G. Fuller of the Wisconsin College of Agriculture, who bases his conclusion on results obtained in experiments at the college. In the experiments Holstein cows were bred to Aberdeen-Angus bulls, and the calves closely resembled the sires—black, polled, compact, and

blocky. Because the calves gave no indication of the blood of their dams they have been called "counterfeit." Nursed for six months, the calves are fed for eight months on a full grain ration and are ready for market at about 15 months of age, and command a premium because of type and finish. Prof. Fuller says a Holstein cow producing 6,000 pounds of milk a year will have no trouble in nursing two or three beef calves. The plan, he says, is well suited to farms where there is a shortage of labor, as a part of the herd can be milked while a few cows are used to give the beef calves a good start.

ENGINEERS FIGHT SOIL EROSION

Valuable information on the practical control of soil erosion probably will result from a study of terracing begun by engineers of the Bureau of Public Roads of the U. S. Department of Agriculture on a 150-acre farm near Guthrie, Oklahoma, leased for the purpose by the Guthrie Chamber of Commerce, which is cooperating. This large-scale study of soil saving and restoration of eroded fields will be carried on while the farm is operated as a going economic concern. This region has suffered much from erosion, and cultivated fields of the test farm have been badly damaged by rain water, while there is pasture land that has not been affected. Terracing will be done according to the best knowledge of agricultural engineers, and runoff and erosion will be accurately measured. The farm work will be done with modern machinery.

PARCEL-POST COW TESTING

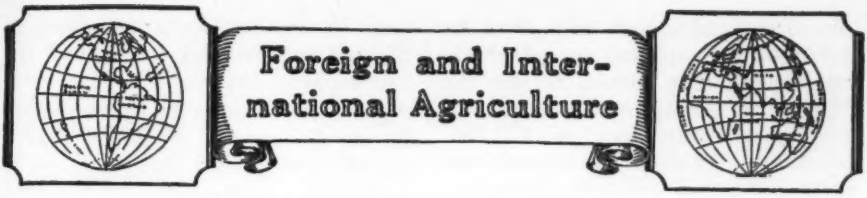
A new convenience in the dairy industry is the use of the postal service in aiding farmers in having their cows tested economically for milk and butterfat production. Recently 75 meetings were held in one week in Monroe county, Wis., to popularize testing by this new method which makes it unnecessary for the tester to visit the farm. The farmer takes samples of each cow's milk and mails them to the office of a trained supervisor who maintains a book of test results for each farmer. In two other counties of the State more than 400 dairymen are now having their herds tested by mail.

OKLAHOMA JOINS TICK-FREE STATES

Territory released from the cattle tick quarantine by the Bureau of Animal Industry order that went into effect December 1 included areas in Oklahoma which made that State entirely white and placed it north of the crooked line that separates the ticky from the unticked. The former ticky or partly ticky States now above the line are: California, Georgia, Kentucky, Missouri, North Carolina, South Carolina, Tennessee, Virginia, and Oklahoma. It won't be long now until the last hungry tick has dropped noiselessly from a grass blade after a futile and lonesome wait for his leather-upholstered lunch wagon.

IMPROVED MILK POWDER USEFUL IN BREAD MAKING

Improvements in methods of drying skim-milk, developed by the U. S. Department of Agriculture, have resulted in a product very satisfactory for use in making bread. When used with a good quality of flour, it has been found possible to get a loaf 10 per cent larger and 4 per cent heavier than when no dried milk is used. In addition, the bread made with the milk powder is more nutritious, has good texture and excellent flavor. Bakers will not object to the cost of milk powder, for they will get more loaves from a barrel of flour.



Justus von Liebig

By Dr. Paul Krische

Translated from Die Ernaehrung der Pflanze, No. 10, 1928 by G. Brate

JUSTUS von Liebig was born on May 12, 1803, in Darmstadt, in the oldest quarter of which his father kept a drug and grocery store. Liebig's father liked to occupy himself with the preparation of drugs for his store and had established outside the town at the Kuhschwanzwiese a sort of laboratory where Justus always gladly assisted his father. He obtained for the boy the necessary books out of the Court Library and thereby became acquainted with the Librarian Hess who later enabled the politically suspicious student to study in Paris.

Liebig plunged with such hot enthusiasm into chemical literature that he neglected his school work with the result that in a class examination, the Director blamed him for his want of diligence. "He is the tormentor of his teachers and the grief of his parents, what does he think will become of him?" When Liebig replied that he wanted to become a chemist, his classmates and the teachers burst out laughing, because at that time nobody had any idea that it was possible to study chemistry.

Heart Set on Chemistry

Owing to his small success in College, in 1818, his father made him an apprentice to an apothecary in Heppenheim. He remained there for only 10 months, because he did not want to become an apothecary but a chemist. At first, he went back to his father, and when at the age of 16 he had studied all the chemical works that were available at the Library of Darmstadt, he urged his father to send him to the University of Bonn where he was sent in 1820. There, Professor Kastner, who was said to be the most eminent chemist of the German Universities, used to lecture. Liebig followed him in 1820 to Erlangen.

Became a Professor

But also in Erlangen it was impossible for Liebig to obtain what he was looking for, namely, the introduction into scientific research work, and when in 1822 he became involved in the liberty revolt of the students and had to leave Erlangen secretly, he decided to go to Paris to Gay-Lussac. He was received there very warmly in the Fall of 1822 and felt entirely in his element.

Alexander von Humboldt's attention was drawn to him and through his recommendation he became in 1824 assistant professor and in 1826 Professor in Giessen. Prior to that, on June 21, 1823, he passed his doctor's degree with the dissertation on "The Relation of Mineral Chemistry to the Chemistry of Plants." In Giessen he founded the first modern chemical

educational laboratory and there he developed such an activity and educational work that Giessen became the "Mecca" of young enthusiastic chemists from all countries. In 1852 Liebig became Professor in Munich and he died there on April 18, 1873.

The chief merits of Liebig are in the line of organic and agricultural chemistry. In the chemical technology he worked out a process on the silvering of glass for the manufacture of mirrors, as well as the manufacture of a "patent fertilizer." On account of his theoretical views on the processes in the organism of the animals and plants, he became the "founder of agricultural chemistry."

Plant Nutrition Ideas

His ideas on the nutrition of the plants which for decades were the foundation of agricultural chemistry and which are still applied at the present time, although modified, were about the following:

The foodstuffs of the plant are inorganic substances, as carbonic acid, water, ammonia, nitrogen, potassium, lime, magnesia, iron, phosphoric acid, and sulphur.

Life and growth of the plant are dependent on the presence of all these foodstuffs. If one of them is missing, even the largest surplus of the others has no effect. Therefore, crop yield is dependent upon the quantity of that foodstuff which is in the minimum or smallest amount. This is the famous "Law of the Minimum" by Liebig, which was recently changed by Mitscherlich and others through the "Law of the Growth of Plants."

The plant obtains only from the soil those substances which after combustion are left as ashes. Therefore, the fertility of the soil is measured by its contents of these ashes.

The other foodstuffs which supply carbon, hydrogen, and nitrogen are not contained in the soil, but in the atmosphere in unlimited quantities. Liebig calls them, therefore, in contrast to the foodstuffs contained in the soil or "mineral foodstuffs" the "atmospheric foodstuffs."

In order to keep a field permanently fertile, the mineral components taken out of it at harvest time, have to be completely substituted. A farming system which does not provide for this is unmethodical or "soil robbing."

All the so-called organic fertilizers such as stable manure, excrements of men and animals, compost, etc., do not have effect through their organic ingredients, but through their inorganic substances which are formed after putrefaction and decomposition, such as carbonic acid, ammonia, mineral substances. (In this respect, recent research work led to more attention to the importance of the organic substances, such as humus, contrary to Liebig.)

Patent Fertilizer

Liebig worked steadily on the practical use of these ideas. For instance, he eagerly supported superphosphate, first produced technically in England and by Lawes. This was a water soluble phosphoric acid obtained by treating bone meal with sulphuric acid. The aim was of course to supply the plants with important foodstuffs in a soluble form. As the lime of the soil changes the superphosphate into a neutral phosphate not readily soluble by water, a washing out of the phosphoric acid by the water of the soil was not to be feared. But leaching, according to Liebig was important with regard to potash. In melting together potash and marl he therefore produced a composition not easily soluble in cold water, the so-called "Patent Fertilizer," which was introduced in England. As it proved unprofitable, the manufacture was was abandoned later on. Afterwards Liebig recognized that he had greatly underestimated the absorption of potash by the soil and had overestimated the leaching quality of the potash.

(*Turn to Page* 47)

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

Unproductive spots in fields that are alkaline or neutral may be due to a manganese deficiency or unavailability in the soil. At least Professor L. G. Willis found that the unproductiveness could be overcome by the application of manganese sulphate to the soil, according to his bulletin, "Response of Oats and Soybeans to Manganese on Some Coastal Plain Soils," North Carolina Experiment Station Bul. 257. The corn is stunted in growth and the soybeans are chlorotic on these deficient soils. These signs are similar to those considered as evidence of potash deficiency, since potash fertilization has been found an effective remedy for this condition. Pot experiments with oats show that lime or calcium phosphate can be used on these soils without harm if manganese sulphate is added. Pure potassium chloride was not found to be absolutely effective in overcoming conditions typical of manganese deficiency. However, the use of crude potash salts in the field is much more effective due possibly to manganese present as an impurity or to the chloride content.

"Fertilizer and Cottonseed Meal Analyses Report," Dept. of Conservation and Inspection, Little Rock, Ark., Dr. W. F. Mangledorf and G. W. Roark.

Soils

"Whiteside County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Report No. 40, June, 1928, R. S. Smith, O. I. Ellis, E. E. deTurk, F. C. Bauer, and L. H. Smith.

Crops

Of especial interest to the readers of BETTER CROPS WITH PLANT FOOD in the large amount of outstanding experimental work done by the Illinois Agricultural Experiment Station as reported in its 41st Annual Report, "A Year's Progress in Solving Farm Problems," is the work done with soils and crops. With particular reference to plant food problems, the Station reports from its findings that crop residues may increase the annual acre value of grain crops all the way from 2c on one field to more than $7 on another; that phosphate may be worth as much as $41 a ton in grain systems of farming; and that both dark and light colored soils may be made to yield better through the use of potash. The value of crop increases from the use of potash ranged from $1.89 an acre annually on one field to $8.75 on another field in the case of light colored soils, while in the case of dark soils, the increases ranged from nothing to $4.98 an acre for the various fields.

Another interesting study on which more data has been obtained is the way in which different corn strains excel in the use of fertilizers. In the Station's last annual report, it was pointed out that strains of corn had been found which varied in their response to potassium fertilization. Another season's results on some of the experimental fields confirm these results. The experimenters therefore conclude that it may be possible to

isolate strains of corn that are superior in the utilization of plant food materials already in the soils or applied in fertilizers.

In the truck growing sections of Cook county results have demonstrated that many vegetables will respond as well to commercial fertilizers as they will to manure, the supply of which is dwindling. In these investigations, the effectiveness of various commercial fertilizer materials is being tested out, especially when they are used as a supplement to or substitute for animal manures.

The report is quite complete in its detail and covers all divisions of the experimental work of the station.

The October issue of the *American Potato Journal* carries an interesting little story of the 30 men in Ohio who made the Ohio 300-bushel club this year, with an average of 358 bushels per acre. The largest yield was 606 bushels per acre. The largest amount of fertilizer used in any one case was 1,600 pounds to the acre; the smallest 300 pounds. The average amount used by all of the men was 883 pounds, and the average analysis was a 3-12-7.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Cal., Vol. XVII, No. 9, Sept., 1928.

"Defoliation of Cherry Trees in Relation to Winter Injury," Agr. Exp. Sta., Geneva, N. Y., Bul. 555, Aug., 1928, *W. O. Gloyer and Hugh Glasgow.*

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 251, Nov., 1928.

"Trees for Washington Farms, Why, Where, What, When, and How to Plant," Agr. Exp. Sta., Pullman, Wash., Pop. Bul. 143, Sept., 1928, *E. H. Steffen and Chas. M. Genaux.*

"House Plants," Ext. Serv., Coll. of Agr., Madison, Wis., Cir. 222, May, 1928, *James G. Moore.*

Economics

A new and very interesting statistical study of the interrelationships of supply and price is published in a new bulletin No. 466, by the Cornell University and Agricultural Experiment Station. According to the authors, G. F. Warren and F. A. Pearson, this bulletin is an attempt to express mathematically some of the relations of supply to price, the relationship of farm and retail prices and effect of supply on these relationships. Consumers pay more for a large crop than for a small crop. Farmers receive less total dollars for a large crop than for a small one. The extra amount paid by consumers remains in the cities.

Wisconsin Bulletin 402, "How Farmers Become Farm Owners," by B. H. Hibbard and Guy A. Peterson is a well worked-out study of how Wisconsin farmers become owners. It is based on the replies to a questionnaire. Most of the farm owners went through three stages—labor at home, hired man, and then ownership. Most men who continue to farm eventually become owners. Ownership comes later in life than formerly but the farm is worth more.

"Economic Aspects of the Fresh Plum Industry," Agr. Exp. Sta., Berkeley, Cal., Bul. 459, Oct., 1928, *Emil Rauchenstein.*

"Crop and Livestock Report 1927," *Pa. D. of A., Harrisburg, Pa., Vol.* 11, *No.* 11, *Sept.* 1, 1928, *Gen. Bul.* 465.

Diseases

"A Fusarium Wilt of Peas in Wisconsin," Agr. Exp. Sta., Madison, Wis., Research Bul. 85, June, 1928, *Maurice B. Lanford.*

PLANT FOOD CONTROLS DISEASE

APPLE trees suffering from mildew were treated with a 12 per cent solution of a concentrated potash salt. (Winter Treatments). Treated trees showed slight traces of the disease while non-treated trees were completely diseased.

Gooseberry trees treated with a five per cent solution kept free from disease. *(Report of the Institute of Market-Gardening Culture at Geisenheim* 1924-1925.)

Justus von Liebig

(*From Page* 44)

The confession of this error is significant. "I had sinned against the wisdom of the Creator and have received the just punishment for it. I wanted to make His work better, and in my blindness I thought that there was one limb omitted in the marvelous chain of laws which fix the life to the surface of the earth and keep it always fresh, that I, the weak powerless worm had to replace. But this limb was provided for, although in such a wonderful manner that the thought of the possibility of the existence of such a law had up to then not penetrated human intelligence, though many facts pointed to it. But the facts that tell the truth become silent, or their voice is made inaudible by the shouting of the error. So it was with me. I had the imagination that the alkalies had to be made insoluble because the rain would carry them off. I did not know then that the earth holds them fast as soon as their solution touches it, as the law which I found in my investigations on the soil crust is the following: The organic life shall develop under the influence of the sun on the extreme crust of the earth. Therefore the Great Builder lent to the ruin of this crust the capability to draw and hold all those elements which serve the nutrition of the plants and by it also of the animals, like the magnet draws and holds parts of iron so that no little part is lost. In this law the Creator included a second one whereby the plant-carrying earth is a huge filtration for the water out of which by the same capability all substances detrimental to the health of plants and animals, all products of decay and decomposition of extinct plants and animal generations, are removed."

His eager fight for the abolition of "soil robbing" was of utmost importance to practical agriculture which he once described as follows:

"The soil robbing which makes the land desolate and uninhabitable can be described in a few words.

"In the beginning, or on a virgin soil, the farmer grows grain after grain. As soon as the yield decreases he goes to another field. The increase in the population limits this migration; he cultivates the same surfaces by letting it lie fallow alternately. The yields decrease continuously, and in order to increase them again the farmer now applies fertilizer which is supplied by natural meadows (three-field system).

"As this substitute is also not sufficient in time, this leads to the production of fertilizer by cultivation of fodder on the same fields. In the beginning the subsoil like the fodder supplying meadow is used continuously. After a certain time fallow years for the fodder plants are inserted. At last the subsoil is exhausted and the fields do not carry any more fodder plants. Then, the pea-disease occurs, afterwards, the clover, beet, and potato diseases, and then the cultivation of the field ceases. The field does not feed man any longer."

Considered Potash

Besides phosphoric acid, Liebig has at all times in his fertilizer theory taken potash into consideration. He wrote in a letter to Guessefeld: "For many years I have pointed out the necessity for the replacement of potash and have shown that the sugar and potash content of the beet are in the closest relation to each other. Now, as in the surroundings of Mag-

deburg on many fields the sugar contents of the beets diminishes so rapidly that replacement is beginning to be considered, and the time will come when everybody will deem the fertilization of the fields with potash just as necessary as that with phosphoric acid."

" . . . I see from your letter of February 22 that you together with others have found a process for the production of potash salts which puts you in a position to supply these salts at a price which permits the application of them as a fertilizer.

"I was very glad to hear this news as I am very much interested in the production of sugar which has gained a very great importance for Germany, and I feared already that it would gradually disappear from Germany owing to lacking replacement of potash. . . ."

While the agricultural chemistry of Liebig met in England with general enthusiasm, it found among the German teachers of agriculture and botanists a number of opponents such as Sprangel, Schleiden, and others. It began the controversy of the exponents of the humus theory as against the mineral theory of Liebig, which lasted for many years. Although Liebig was right in his appreciation of mineral foodstuffs, yet on the other hand, the importance of humus and of nitrogen for artificial fertilization was doubtless underestimated by him.

Liebig's Working Place

Nobody realizes today under what difficult circumstances Liebig had to work during the first years in Giessen, the main period of all his work. In 1832 he described in a petition for a new building his working conditions as follows:

All weighing had to be done in the small cabinet covered with stone plates which contained the collection of apparatus, instruments, and preparations and therefore could not be heated. On account of this condition, he was forced to stay for hours in this room which during the winter months was mostly as cold as ice. Through the erection of a fireplace in the center of the room, it had been possible in the real laboratory to accept a number of assistants. All the more necessary was the conducting away of the damaging vapors, but as instalments with regard to this were not yet made, it was necessary to ventilate through the opening of windows and doors. Here, he had to carry out his investigations, amidst his workers exposed to the damaging vapors, the draft, the dust, and vapor of the carbon, and it was not to be wondered at if his health would be considerably affected. Even the new building finished in 1839 could not stand a comparison with the present wonderfully furnished working rooms of the agricultural chemical research institutes.

His Works

The following of his literary works are the most important: 1. The book published on the instigation of English friends in 1840 after his first voyage to England (1837) "The Application of Organic Chemistry on Agriculture and Physiology." 2. "The Application of Animal Chemistry or Organic Chemistry to Physiology and Pathology." 3. "Theory and Practice in Agriculture." 4. "Chemical Letters." All of his works are remarkable through their vivid and peculiar style and are so fascinating and rich in ideas that their study is still at the present time delightful to the chemist and the educated layman. They belong therefore to the first literary range and are really classic writings.

No One Else But

"Rastus, does you love me?"

"Mandy, you is one woman I don't like none other no better than."

FERTILIZER RECOMMENDATIONS

For Tobacco Grown on Average Soils in Virginia, North Carolina, South Carolina, and Georgia during 1929.

I—*Fertilizers for Bright Flue-cured Tobacco*

1. *Analyses of Mixtures*:

(1) *For Heavy or More Productive Soils*—Eight per cent available phosphoric acid, 3 per cent ammonia, and 5 per cent potash, except for gray soils with red subsoils of the Cecil series of Virginia where 8 per cent available phosphoric acid, 3 per cent ammonia, and 3 per cent potash are recommended.

(2) *For Light or Less Productive Soils*—Eight per cent available phosphoric acid, 4 per cent ammonia, and 6 per cent potash.

2 *For Control of "Sand-drown" (Magnesia Hunger)*:

For sections where "sand-drown" is prevalent, it is recommended that fertilizers carry 2 per cent magnesia (MgO). This may be derived from sulphate of potash-magnesia, dolomitic limestone, or any other material carrying magnesia in forms known to be available to the plant.

3. *Amount of Fertilizer*:

Use 800 to 1,200 pounds per acre in the drill thoroughly mixed with the soil just before transplanting.

4. *Sources of Plant Food Constituents*:

(1) Phosphoric acid—Derived from superphosphate.

(2) Potash—Derived from a combination of high grade muriate of potash with either high grade sulphate of potash or sulphate of potash-magnesia, or both.

Available experimental data at this time from bright tobacco sections of Virginia, North Carolina, South Carolina, and Georgia show that a small quanity of chlorine in the tobacco fertilizer increases the acre value of the crop. Experience has shown, however, that an excessive amount of chlorine in fertilizers used for tobacco injures its growth, producing a thick brittle leaf, and also has an unfavorable effect upon its burning quality. It is recommended, therefore, that fertilizers be compounded with the above named sources of potash in such proportions that the fertilizer mixtures shall contain a maximum of two per cent of chlorine. Since research has shown that heavier applications of high grade potash are profitable, it is recommended that the potash content of mixed fertilizers exceed that of ammonia by at least two units, except for gray soils with red subsoils of the Cecil series in Virginia.

(3) Ammonia—One-half of the ammonia should be derived from high grade organic materials of plant or animal origin such as cottonseed meal, fish scrap, and high grade tankage. The remaining half should be derived from urea and standard inorganic sources of nitrogen such as nitrate of soda and sulphate of ammonia, at least one-fourth of the total ammonia being supplied by nitrates.

II—*Fertilizers for Dark Tobacco (Sun-Cured and Shipping)*

1. *Analyses of Mixtures*:

Use 8 per cent available phosphoric acid, 3 per cent ammonia, and 3 per cent potash.

2. *Amount of Fertilizer*:

Use 600 to 1,000 pounds per acre in the drill at or just before transplanting.

3. *Sources of Plant Food Constituents*:

(1) Phosphoric acid—Derived from superphosphate.

(2) Potash—Derived from sul-

phate of potash-magnesia, high grade muriate of potash, or high grade sulphate of potash.

(3) Ammonia—One-half of the ammonia should be derived from high grade organic materials of plant or animal origin such as cottonseed meal, fish scrap, and high grade tankage. The remaining half should be derived from urea and standard inorganic sources of nitrogen such as nitrate of soda and sulphate of ammonia, at least one-fourth of the total ammonia being supplied by nitrates.

W. W. Garner, Washington, D. C.

T. B. Hutcheson, Virginia, Secretary,
T. L. Copley, Virginia,
E. G. Moss, North Carolina,
E. Y. Floyd, North Carolina,
L. G. Willis, North Carolina,
C. B. Williams, North Carolina, Chairman,
R. E. Currin, Jr., North Carolina,
T. S. Buie, South Carolina,
R. E. Currin, Sr., South Carolina,
E. C. Westbrook, Georgia,
J. M. Carr, Georgia,
W. F. Pate, Soil Improvement Committee, N. F. A. Oct. 17, 1928.

L. R. Barton

(*From Page* 29)

also wood, and we have made a specialty of maple sugar and syrup. At one time we set about 1,500 buckets, and the returns from same, together with butter, were our principal income.

"Of course, my family expenses have been large much of the time. There were times when we had 16 pairs of shoes to buy every year, 16 shirts, and other needed supplies. It took at times a barrel of flour a month to feed the family, but of course the vegetables, meat, milk, butter, etc., we supplied from the farm. But in spite of this, we had to economize in order to meet the bills and save a little for future use. But we have always aimed to keep ahead and put aside in the bank at least $100 a year.

"About eight years ago we sold the home place of 120 acres and later the Pike Hill farm of 150 acres, retaining only the pasture of 26 acres. We then purchased a farm near Kelleyville of 250 acres and a little later an adjacent farm of 100 acres, making 350 acres in all. These farms are paid for, and we have money in the bank. This past year we raised three acres of corn, one acre of potatoes, two and one-half acres oats, and one-half acre of beans. We had a good garden, and cut about 75 tons of hay.

"Of course, we use a considerable quantity of high-grade commercial fertilizer for the various crops to balance the farm manure which we have. We find this necessary to get the best yields of the various crops.

"We set about 800 sap buckets, and we have 29 head of stock. At the present time, in addition to our living from the farm, we aim to average at least $100 per month cash returns from sale of milk and other products.

"Since an injury to one of my hands, we devote more time to raising dairy cows to sell, veal calves, and beef, and do not produce as much milk as formerly. We also keep some poultry to supply our own needs."

Mr. Barton is a native-born Yankee, and a descendant of old Revolutionary stock. He and his wife know what hard work is, for it is only by hard work that they have saved and accumulated. They are teaching their large family the value of good, honest endeavor and trying to equip them mentally and physically so that they will be able to meet life's battles successfully after they leave home.

Mr. Barton believes in farm organization, is a member of the County Farm Bureau and has children in 4 H Club Work.

Pages From A Field Note Book

Find Fertilizers Pay

By Robert V. Peterson

Stillwater, Oklahoma

MANY Oklahoma farmers have contended that because their state is a virgin one there is no need to use commercial fertilizer for the production of good crops. As a result but little commercial fertilizer has been sold in Oklahoma as compared with that sold in other southern states.

However, a few scattered demonstrations this past year have shown rather conclusively that even in a virgin state the application of commercial fertilizer may increase yields considerably. For instance, there is the experiment which J. M. Stalnaker of Tishomingo, Oklahoma, conducted on the fertilization of potatoes. This farmer's soil is an upland, sandy loam which had previously been planted to cotton. This check plot which had no fertilizer yielded at the rate of 36 bushels per acre. A second plot which had 400 pounds of an 8-4-0 per acre yielded 95 bushels per acre; a third plot which had 400 pounds of an 8-4-4 yielded at the rate of 121 bushels per acre, while a fourth plot supplied with 500 pounds of 8-4-4 to the acre yielded at the rate of 140 bushels per acre, nearly four times that of the check plot.

In another demonstration conducted by Otha Johnson of the same community on similar soil, a check plot yielded 40 bushels to the acre. An 8-4-6 fertilizer applied at the rate of 250 pounds to the acre produced 77 bushels on another plot. A third plot receiving an 8-4-6 fertilizer at the rate of 500 pounds per acre produced 101 bushels of potatoes per acre.

These farmers, despite the low price of potatoes, were well pleased with the tests made, because the fertilizers not only paid for themselves but provided a nice profit.

Fertilizers for Cucumbers

By G. R. Cobb

Salisbury, Maryland

A DEMONSTRATION of importance to the truck growers on the eastern shore was that recently made on the cucumber crop of Leroy N. Huston, on his farm at Delmar, Delaware. The relative value of applications of commercial fertilizer and a commercial fertilizer and manure combination were compared. Growers in this section have used a large

amount of manure thinking it quite necessary to truck crops. At the price of $6 per ton, the manure is much too expensive for general use.

Mr. Huston used the Clark's special variety of cucumber. On Plot 1 he applied 10 tons of stable manure from the city stables and 600 pounds of 5-8-5 fertilizer. On plot 2, he used 1,200 pounds of a 5-8-5 fertilizer. The first plot yielded at the rate of 203 bushels per acre; the second, 210 bushels per acre. The cost of the fertilizer and manure, including hauling and spreading, used on the first plot, was $78; the cost of the fertilizer on the second plot was $36. The returns on the 203 bushels of the first plot, less the expenses were $133.12; the returns on the 210 bushel yield of the second plot, less the expenses, were $182.40. This leaves a difference of $49.28 in favor of the commercial fertilizer treatment.

Eradicating Quack Grass *With* Sodium Chlorate

PROFESSOR A. A. HANSEN of Purdue University describes a method for the successful eradication of quack grass in the *Journal of American Society of Agronomy*, Vol. 20, No. 10, p. 1120, Oct. 1928.

Indications are that this very serious pest can be completely killed by the use of 10 per cent solution of sodium chlorate.

The grass should be mowed and after the sprouts are 6 to 10 inches high, they should be saturated with the solution. This solution is sprayed on the plants and may be made by dissolving one pound of the material in one gallon of water. Two or more sprayings usually are necessary to completely kill the grass.

Sodium chlorate has been found to be more effective than other chemicals used, killing both tops and roots. After spraying, the plants turn brown and die in about a week. A few of the more hardy plants may start again, which are usually killed with the second spraying. There are cases on record where the solution was applied to areas of quack grass and two months later all of the quack grass was dead and other grasses or clover had worked their way in. This brings up the important point that sodium chlorate seems to have no harmful effect on the soil.

Sodium chlorate is a white crystalline substance somewhat resembling common salt, although not salty to the taste. It is not poisonous to men or farm animals, but is said to be inflammable when mixed with organic matter. Although the author has had no trouble of this character, he advises mixing outdoors. In 112 pound kegs, it sells for 6½c a pound, f.o.b., Niagara Falls, N. Y.

Sodium chlorate has also been found effective against Canada thistle and field bindweed. The author states that the exact manner in which the material acts on plants is not known.

NEW BRICKS

If a man were hit with the new kind of brick which is said to be on the market now, he probably would not be deceived as to its nature, although an innocent bystander might be fooled. This new brick is made to look like a piece of log with the bark on, and is a substitute for lumber.

The County Agent in an Emergency

(*From Page* 14)

same summer of 1926, some 30 counties in the central and northeastern parts of Georgia were unfortunate in not having a soaking rain from April until October. The farmers in these counties depend upon corn for grain feed and cow-pea hay for forage for their livestock. The corn crop and the summer hay crop of cow-peas both failed. The cotton crop, from which cash is usually obtained, was reduced about 60 per cent, making it very difficult for most of the farmers to see their way clear to continue farming unless some plan was worked out.

The reports from the county agents indicated the situation to J. Phil Campbell, Director of the Extension Division of the Georgia State College. Mr. Campbell called a meeting at the college to discuss the emergency. County agents from these counties brought with them their leading advisors. It was quickly decided that the most important thing to do was to get feedstuff for the livestock as quickly as possible.

The Campaign

Southeastern Georgia had a surplus of corn which could be obtained reasonably. In view of the situation, the following plans were made: 1. Each county agent in the drought area was to assist the farmers in his county to obtain corn from the southeastern section as quickly and with as little expense as possible, as corn would be needed to feed the livestock through the winter; 2. A campaign was to be put on throughout the territory affected by the drought to get sufficient acreage sown in fall grains as wheat, rye and oats, winter hay of oats and vetch, or wheat, oats, vetch, and crimson clover, which mixtures are adapted to the section so that by the beginning of the next cropping season there would be on the farms sufficient feedstuffs to carry through the next season; 3. As there would be farmers everywhere without sufficient resources, owing to the drought, to accomplish these first two objectives bankers and business men would be enlisted in this emergency program so that the basis for future production would be established.

To deal with 30 counties as a whole is a difficult task. If an organization had to be set up, before it could be worked smoothly, the emergency probably would have solved itself in driving many of the farmers from their farms. But a county is not a difficult unit to organize or to get started. Still easier to organize is a community. These county agents were in position to start with each community in their respective county. This was done. Weekly papers all over this drought section later reported excellent yields of oats, wheat, and unusual yields of winter hay. The plan developed for that emergency brought results because of the fixed purpose of county extension work.

It has been my observation that during an emergency, whether it is local or of importance over a wide area, the people who step into the positions of trust and responsibility are those who have by their past deeds demonstrated their good judgment, dependability, and ability to work with and for others toward an objective. If my observations are correct, I would say that it is a part of the county agent's work to function speedily and soundly during any farming emergency that may arise, and that to be in position to do this a county agent must lay a solid foundation by demonstrating correct practices on farms.

Potatoes

(*From Page* 30)

tures and moderate rainfall. Even when grown in southern States, potatoes are planted so as to mature during the cooler months of the year. Of the world acreage, the largest single portion, about 27 per cent, is in Russia. Germany has about 16 per cent and Poland a little over 14 per cent. France is fourth with 8.5 per cent and the United States fifth with seven per cent.

Europe grows about 90 per cent of the world's total. In the United States the production is less than four bushels per persons while in Germany it has been around 24 bushels per person. The actual yearly consumption as food in the United States is about 2 2/3 bushels per person as compared with about 7 1/3 bushels in Germany.

The potato acreage in the United States lies largely in the cooler northern states. The southern production is largely of early varieties and for the early markets. Nearly 42 per cent of the nation's acreage in 1927 was in six states, Minnesota, Michigan, New York, Wisconsin, Pennsylvania, and Maine. According to the 1925 census, potatoes are grown on about 36 per cent of all the farms in the United States.

A notable change has come in the American production during the last 40 years, in the increased production per acre which has been obtained. The high point in acreage was reached during the World War when, in 1917, a total of 4,384,000 acres were grown. The crop was then expanded on soils and areas not well suited to it with the result that rather low yields were made. The high point in production occurred in 1922 when over 453,000,000 bushels were grown on 4,307,000 acres. Since then the acreage has been much lower, yet with about 3,842,000 acres the preliminary estimates of production for 1928 indicate the record production of over 460,000,000 bushels.

Production per acre has advanced markedly. For the 10-year period beginning with 1880, the average production for the United States was only 76 bushels; for the decade 20 years later beginning with 1900 the average was 92 bushels. For the first eight years of the present decade beginning with 1920, the average yield is about 110 bushels. These increases may be attributed to the fact that in the earlier period yields were unusually low because of the damage from the Colorado Potato Beetle and prices were also low. The increases in yield may be explained by the influence of newer methods, such as disease and insect control, the use of better seed stock, and the growing of much of the crop under commercial conditions where good equipment, fertilizers, and other factors are available, and where reasonably good market outlets act as a stimulus to this type of production.

Field Bindweed

(*From Page* 13)

of the ground and these will not be affected by the chemical. If left until seed has formed before making the first application trouble will be encountered with seedlings after the old plants are killed.

The time of making succeeding applications of spray is difficult to determine because the normal blooming period has passed and the appearance of flowers cannot be relied upon. All treatments after the first one should be made when the plants appear to have recovered from the effects of the previous spraying, are back to a normal green color, and are making normal growth.

Sodium chlorate is highly combust-

ible when it comes in contact with certain materials and, hence, is a dangerous chemical to work with. The Kansas station recommends that farmers go slowly in their attempts to kill out the troublesome weed, inasmuch as more experimental work is needed before final recommendations can be made. However, farmers who have areas infested with the weed should isolate them and keep them clean by cultivation.

GREEN MANURING

A NOTABLE addition to the Wiley Agricultural Series, edited by Dr. J. G. Lipman, has been made by Dr. Adrian J. Pieters, of the U. S. Department of Agriculture, in his recent book, "Green Manuring" (John Wiley & Sons, Inc., New York, $4.50). In a thorough and concise manner, Dr. Pieters discusses the principles and practices of green manuring, securing his material from his own experiences and from those of the best authorities of the United States and other countries.

The general problems of food production and the history of green manuring are briefly discussed in the opening chapters, after which the problems of organic matter and nitrogen in the soil are considered. The rest of the book discusses the chemical composition of common green manuring plants, their culture, and their decomposition; the value and benefits of green manuring; and green manuring problems and practices in general and for different farming systems and crops in the various parts of the United States and other countries. The last chapter is a discussion of the economics of green manuring.

When discussing the use of green manure, Dr. Pieters says: "The green manure crop should be given mineral fertilizer when necessary, though unfortunately, there is an idea that a soil improving crop can take care of itself. * * * If it is desired to improve a poor soil, the green manure crop should be liberally fertilized. * * * In general, 300 pounds of acid phosphate and 100 or 200 pounds of potash salts per acre, either alone or together, as may be needed, will be found to benefit the green manure crop." (Page 150).

Dr. Pieters' excellent book should prove to be of value and interest not only to teachers, research workers, and students, but also to the practical farmer attempting to secure the greatest profits from his soil, by following the best soil management practices.

POTASH FOR FLAX

"THE potassium ion seems to be an especially important nutrient for fibre flax," says Professor W. L. Powers of the Oregon Agricultural Experiment Station in an article entitled, "Fertilizers for Fibre Flax." This clearly written article appeared in the Journal of the American Society of Agronomy, Volume 20, No. 7, page 755, July, 1928.

The author further states that potash appears to give strength to the plant, increase its fibre, make the plant more vigorous and disease resistant, and increase the ratio of fibre to seed, under the conditions of these experiments. Potash and nitrates together usually gave the best results, while small amounts of superphosphate sometimes aided root and seed development.

Investigations indicated that potash was especially important in the early growth period of flax. Irrigation also improved the yield and quality of fibre in this section.

A Shucking Contest

(*From Page* 23)

yielded 210 bushels, or 70 bushels per acre. Since every one who knew the field stated that it was of uniform fertility, it can be said that the 19½ bushel increase per acre on the latter three acres was due largely to the application of the nitrogen and potash. This extra fertilizer cost approximately $7.50.

Mr. Estes is considered one of the best farmers in Orange county. When he purchased this particular piece of land a few years ago, his neighbors, some of whom were present during the shucking contest, said it could never be made to produce profitable crops. Last year (1927) more than one and one-half tons of hay per acre were cut from it, and this year's corn yield record is stated above. Wheat will be seeded this fall, followed by grass and clover.

The shucking contest shows that shucking a crop of corn has quite an influence on the cost of producing the crop. Suppose we use the results obtained by the five winners in this contest as an illustration, if each man had been paid $2.50 on the basis of a 10-hour day, the seven barrels shucked by the man who won fifth place would have cost 21c per barrel, while the corn shucked by the man who won first, would have cost 16c per barrel.

Good farming consists not only in improving the fertility of the soil, but in keeping it fertile by the proper use of crop rotations, lime, legumes, good seed, and fertilizer.

Farm Conditions

(*From Page* 22)

an evidence of vigor in the industry, and an indication that its rewards have sometimes been under-estimated.

If agriculture is as badly off as it is reported to be, why has the flight of men from the farms not been accompanied by a great decline in acreage? In 1919 the acreage of the principal crops was 351,209,000 acres. In 1920 it was 345,089,000 acres; in 1921 it was 345,893,000 acres; in 1922, 347,616,000 acres; in 1923, 349,428,000 acres; in 1924, 342,155,000 acres; in 1925, 346,575,000 acres; in 1926, 350,334,000 acres; and in 1927, 349,554,000 acres. An increase of 8,000,000 in 1928 brought the year's area of harvested crops to the figure already given, namely 357,400,000 acres, a record. The well-maintained acreage and the increased production of American agriculture since the war imply either that our farmers know what they are doing or that they do not. It is just as well to give them the benefit of any doubt that may linger.

In a short article it is impossible to give all the grounds for taking a cheerful view of agricultural prospects, but one more consideration should be mentioned. Much rather hard-boiled doctrine has been promulgated about agriculture in the last year or two. It has been contended that agriculture is in the throes of a technical revolution which must ruin thousands before prosperity is restored for the industry as a whole. It is said that the efficient few, with large farms and high-powered machinery, will make life impossible for the inefficient many. Two

fundamental objections destroy this theory. In the first place, variations in efficiency, though wide between the most and the least efficient farmers, are relatively narrow when the great bulk of the producers are taken into consideration. Now it is the great bulk of the producers who supply most of the world's demands for farm products. High efficiency in the upper crust certainly obliges the others to do some hustling, but does not represent an economic advantage great enough to give what might be termed a monopoly advantage to the leaders. Combine-harvesting, for example, may tend toward a higher concentration of wheat farming in the States best adapted for that method of saving the crop, but will not abolish all the reasons for producing wheat elsewhere. Nor will large-scale cotton growing in the New South put the Old South out of business. Cotton will continue to be grown where soil and climate make it a suitable crop.

The second point about the efficiency scare is its false assumption that through competition all the advantages of efficiency pass ultimately to the consumer. It is argued that under present conditions there is no money in farming except for the very low-cost producers, whose output swamps the market and lowers prices to a point at which profits disappear for the general mass. That sounds alarming until one inquires why competition has not abolished profits heretofore. The answer is simple. Human energy aided by capital and applied to land and other natural resources returns a surplus of value above production costs. This surplus can not be dissipated though it may be subdivided by competition. Usually what happens is that competition drives out some of the least efficient producers, concentrates more than a pro-rata share of the total business in the hands of the most efficient, and forces the rest to take less than the average rate of profit. They are not compelled, however, to take no profit at all, because the claims of land, labor, and capital to the results of productive enterprise cannot be gainsaid. Lower prices to the consumer sometimes cause the surplus between production costs and prices to vanish, but that is an exceptional rather than a prevailing condition. Generally the effect of competition is not to cause the disappearance of profits but simply to determine their distribution.

It is poppycock to talk about the efficient few driving all the other farmers out of business. As a matter of fact, if the truth must be admitted, the influence of competitive efficiency is relatively less in agriculture than in other occupations, owing to the relatively greater part played by nature in farming. It is well for the farmer to be efficient; but it is seldom fatal for him not to be.

Agriculture Today

(*From Page 26*)

pigs are good 'doers,' making rapid gains, produce the cheapest pork. In addition to tremendous death losses of pigs in the United States, many pigs are stunted as a result of parasitic infestation, the common intestinal roundworm being one of the most injurious of swine parasites.

"The bureau is distributing bulletins, motion pictures, exhibits, and posters on the subject of practical swine management and sanitation. It is constantly conducting experiments

in search of better methods of raising hogs. The so-called McLean County system of swine sanitation has been worked out by the Bureau of Animal Industry to avoid worm infestation or at least to reduce it to a point at which it will cause little or no damage.

"This system consists simply in thoroughly cleaning and scrubbing the farrowing pen to remove all worm eggs, in doing the same to the sow, paying special attention to the udder to remove the eggs of the parasite, and in removing the sow and her pigs to a field sown to forage crops within 10 days after farrowing. The field must not have been pastured to swine since it was sown. The pigs are provided with a good supply of water and shade and kept in this field for at least four months, after which time they are reasonably safe from severe or injurious worm infestation."

Includes Poultry

Numerous important problems in the poultry industry are cited by Dr. Mohler. These include the need for improvement in quality of both eggs and poultry meat, improvement in the sanitary conditions of many plants with a view to reducing mortality in young and old stock, and more efficient means of feeding all classes of poultry. The bureau is making experiments to determine the nutritional requirements of growing chicks, laying hens, and market poultry; conditions giving rise to parasitic infestation are being investigated; work is being done to eradicate avian tuberculosis; the transmission of bacillary white diarrhea is being investigated; considerable progress has been made in the study of the inheritance of egg production and in a determination of the general effects of close inbreeding.

The bureau's program of tuberculosis eradication from livestock has been in effect since 1917, and has reached the point where Dr. Mohler believes that "with the fine spirit now existing in practically all the States; it is estimated that within the next decade tuberculosis in livestock will be a rarity." It is estimated that whereas in 1917 approximately four to five per cent of the cattle in the United States were infected with tuberculosis, only two per cent are now so infected. These estimates are supported by the marked reductions in the retentions of cattle and swine at official abattoirs where meat inspection is conducted.

Disease-free Areas

There are now in the United States 581 counties, in addition to 21 towns and parts of two other counties, which have been officially declared as practically free from tuberculosis. These areas have become centers of prosperity in the livestock industry; particularly, those areas which have considerable numbers of dairy animals included in the cattle population. An evidence of the popularity of these counties is shown by their increased interstate shipments. During the past fiscal year, Wisconsin exported more than 85,000 cattle; Minnesota and Tennessee also did a big business in the sale of dairy cattle.

The increased consumption of milk in the United States, now 221 quarts per capita as compared with 172 quarts in 1918, is attributed largely to tuberculosis eradication in the assurance to consumers of a safe supply of milk and other dairy products. Tuberculosis eradication is encouraging dairy farmers to establish better methods of milk production and handling, and to introduce better producing animals in their herds.

A survey made recently by the bureau to determine the economic benefits of tuberculosis eradication indicated that the work has made for higher priced cattle and better markets, better breeding cattle in replacements, less losses in packing houses, large premiums for swine from the Corn Belt, and better and more uniform milk production.

A 100-Bushel Club

(From Page 27)

¼ acre was $30.82 or 29.3 cents per bushel, 88 man-hours of labor being used. In computing the cost, the labor of the club members was figured at 15 cents per hour and horse labor at 12¼ cents per hour.

Each member used certified Early Ohio potatoes, each planting 4 bushels on ¼ acre of ground. Each member treated his potatoes with corrosive sublimate by soaking in barrels for 1½ hours at a cost of 60 cents for material and 22½ cents for labor.

Each member was given proper instructions on treating the seed, preparation of ground, and cultural practices to follow before he received his potatoes.

Due to fact that potatoes were received on March 28 and were planted from March 29 to April 6, there was no time for green sprouting. Each member plowed his soil from 6 to 9 inches deep. The soil was a clay loam in all cases except one, which was a sandy loam. The sandy loam produced the highest yield, also potatoes of the best quality. Each member applied from 4 to 6 loads of manure to the ¼ acre and five applied at least one sack of 2-12-6 fertilizer. One boy used 1-8-2. The members started cultivation with the harrow soon after planting and cultivated an average of five times, using the harrow and cultivator. Four of the members raised their potatoes on soil that had never been in potatoes before and the others had soil that had not been in potatoes for several years. All except one had a sod of some kind to plow under.

There was 14 boys in the club that did not use any fertilizer and their average yield was 54 bushels per ¼ acre. Some of these 14 boys had unusually good ground or their average would have been much less.

Martin county, Indiana, has never been a potato-growing county. Statistics show that its average production is about 81.4 bushels per acre and not many acres have been raised. It looks as though the figures of these 4-H Club members will show that it is possible for farmers of Martin county to produce more and better potatoes and produce them at a profit. This year Martin county produced more potatoes than it has ever produced, and the future potato supply of the county is assured unless low prices this year cause too many to grow something else next year.

The average yield of the entire 74 club members was 64 bushels on ¼ acre. Some of the members lost nearly their entire crop by wet weather.

A Potash-hungry Soil

(From Page 7)

following representative treatments on limed land (1) superphosphate, (2) superphosphate and muriate of potash, (3) superphosphate, muriate of potash, and nitrate of soda, (4) six tons manure reinforced with 180 pounds superphosphate. The treatments are applied biennially (1) to corn and wheat in a rotation of corn, oats, wheat, and hay (mixed clover

	P	PK	PKN	*MP
Corn	100	278	275	256
Oats	100	175	131	144
Wheat	100	231	218	191
Hay	100	171	141	185
Total air dry matter	100	208	207	200
Ensilage corn	100	177	215	192
Buckwheat	100	125	119	121
Kentucky blue grass hay	100	167	264	245

*6 tons reinforced manure.

and timothy), (2) to oats and ensilage corn in a rotation of oats, mixed hay, ensilage corn, and buckwheat, and (3) to permanent Kentucky blue grass pasture. The following rates per acre of the several treatments are applied—400 lbs. superphosphate, 100 lbs. muriate of potash, 300 lbs. nitrate of soda, and six tons manure.

Results Secured

Within a few months following the beginning of the experiments it became evident that the economic production of the crops essential to a good dairy system depended upon the systematic use of lime and commercial fertilizers or manure. Not only did the best treatments produce much greater yields, but considerably hastened the maturity of the grain crops, the latter a vital factor in the production of corn in this section. It soon became evident that potash had an exceptional value on this soil. The following extreme yields were secured from the various treatments. Ensilage corn was increased per acre from an average of 5.8 to 19 tons, buckwheat from 6.3 to 33.7 bushels, corn from 9.7 to 38.9 bushels, oats from 21.1 to 41 bushels, wheat from 1.0 to 22.1 bushels, clover and timothy hay from weeds to 4,430 pounds, and Kentucky blue grass hay from weeds to 3,008 pounds.

Value of Different Treatments

The summary above serves to show the relative value of four representative treatments based on the increases over the corrected (assumed) yields of check plots.

In this summary of four treatments in the production of seven crops on limed Volusia soil, the value of superphosphate is taken as 100.

The above results show clearly the relative value of the four treatments. In the four-year grain rotation of corn, oats, wheat, and hay, potash increased the three grain crops 128 per cent over superphosphate, 20 per cent over the complete fertilizer, and 31 per cent over reinforced manure. The total weight of the four crops was 108 per cent in excess of superphosphate alone. Ensilage corn was increased 77 per cent by the addition of potash to the superphosphate treatment. Only in the case of ensilage corn and Kentucky blue grass hay did the PKN treatment have a value in excess of PK.

Additional experiments must be conducted on this soil in several sections of the State before we can determine if this high potash response is peculiar to this particular soil area. Soil variation may be partly responsible for the remarkable response to potash, however, since the potash response was similar on all three fields studied based on the ensilage corn, Kentucky blue grass hay, and the results on the four-year grain rotation, it is unlikely that soil variability plays an important part. These experiments in general show that in this dairy section of northern Pennsylvania the major proportion of the necessary cattle feed can be produced economically through the systematic use of lime, commercial fertilizers, and farm manure.

Holly Time

(*From Page* 4)

dedicated under similar home environment on this sacred occasion. The quiet faith of our fathers on December 25th has done as much to establish a sounder national life as the glamor and clamor of July 4th.

Christmas is dedicated above all else to those who lead lowly and simple lives. It is the day of the ruddy hearth, the cheery greeting, and the unselfish thought. Simplicity and common brotherhood are the things we emphasize at Christmas.

CHRISTMAS is dedicated to common folks of the work-a-day world because it was that way in the beginning. Whatever pomp and embellishment mankind has added to its observance is to a great extent artificial and beside the mark and meaning of the day. I do not argue for a harsh Puritanical Christmas bereft of human jubilation, but I hold fast to the inherent truth that Christmas is of, for, and by the everyday home folks whose common tasks make the world a joy forever.

Simple and lowly folk delight in Christmas because the actors in the Great Drama and those who lived in the Light of the Star were of simple and modest lives—farmers, shepherds, stockmen, fishermen, carpenters, and craftsmen. The farmers and stockmen of Palestine had come to pay their taxes on that first Christmas eve when the inn was overflowing; and their humble beasts of burden found a consecrated resting place for the night. Out on the everlasting hills of Judea the watchful shepherds played their part. Joseph was a master craftsman, a member of the carpenter's guild. Half a dozen honest fishermen were even then picked for places of destiny. Thus we see that the first Christmas eve elevated common people to the first place of dignity and honor which it had been their lot to fill.

What then of the rulers and the emperors and the kings, the courts and the nobility? In that age-old chronicle we find no flattering mention of kings, except the King of Kings. We find no praise of nobility, except nobility of soul. It is true there were potentates galore, but they cringed on shaky thrones, and trembled as the Christmas dawn came on.

So much for kingship and rank; what of wisdom? The answer is that the Magi, the three wise men of the East, themselves sought long and far for the simple Truth and found it at last in the obscure abiding place of a stable.

The substance of it all is that kindness, simplicity, nobility of character, and hard work outweigh pomp of power and regal state, and at times even excel the accomplishments of wisdom. Loving kindness, honor, and industry are symbolized by the star that tops the glittering tree at many a cosy fireside. Special grace at this holiday, I take it, is extended to the tillers of the soil, husbandmen of herds and flocks, and fashioners of wood and metal. But men who work with their hands have also obligations to their hearts and minds.

THE first Christmas gifts were those presented by Wisdom to Love under the rays of the Bethlehem star. In modern times wisdom sometimes fails to attend the giver. Some of us imagine that Christmas gifts should be manifestations of buying power, when they are anything but that in truth.

If Christmas gifts are measured by the dollar mark, then we have lost the spirit of the day. If this were true, if the full purse meant the key-

note of the day, then these brethren of lowly degree would be unable to partake. But happily this is not so! The gift bought at a ten-cent store and secretly treasured by the donor for joyful presentation on Christmas morning bears the priceless symbol of the occasion, the manifestation of love and devotion, perhaps of sacrifice.

No diamond artisan of Amsterdam could fetch more precious testimonials of affection than the simple little offering hallowed by heart's desire. And the best gift of all gifts is the one which has its donor's life woven or knitted into it.

Better even than gifts at Christmas time are the reunions of families and fond remembrances between those long separated. Back to the old home, and back to those old, familiar faces!

FAMILY love is at the root of Christmas—not family for caste or class, but family for courage and companionship. How much this means to agriculture! The farm family is the center of all things past in real achievement and the center of all things to come in the solution of agricultural problems. Devotion and renewed courage for the family at Christmas time comes handily just before New Years with its new work and greater resolves.

Were there no Christmas on the calendar, where would hope be? If there were no New Years, where our ambitions? If we had neither hope nor ambition, where would we get our faith? And a rare combination of hope, ambition, and faith gives us our ideals.

Hope, ambition, faith, and ideals have wrought mighty things. They have cleared our empires, tilled our land, built our homes, improved our livestock, and given to every farm hand the mechanical power of five before him. What more dare we expect time to bring? The answer rests with the people who gather at the rural firesides, merry with Christmas music and happily decked with holly.

There is an ancient German legend which fancies that the animals of stable and fold possess the gift of speech in the quiet solemn hours before the dawn of each recurring Christmas day.

While the rafters snap in the bitter cold, as the hoar frost gleams in the moonlight, and the children lie dreaming of the joys of tomorrow, it is pleasant to imagine now—as we imagined in our boyhood days—that the lowly herds in conversation at this reverent hour might have some words of admonition for the soul's enlightenment.

For humble and slavish as they are, bred and accustomed by ages of servitude to look to man for leadership and life, these selfsame beasts have fabled ancestors whose parts in life were cast in nobler molds.

The starry constellations bear their names, reminders of the thrones these animals occupied in mystic days of old. Aldebaran of Taurus is an echo of the bulls of Bashan. The mighty horse held place of honor in Assyrian halls.

But no borrowed glories of heathen idolatry give voices to the stabled flocks and herds in Yuletide story. They speak, if fancy pleases, because of Bethlehem, because of the Star, because of the Majesty that hallowed their mangers.

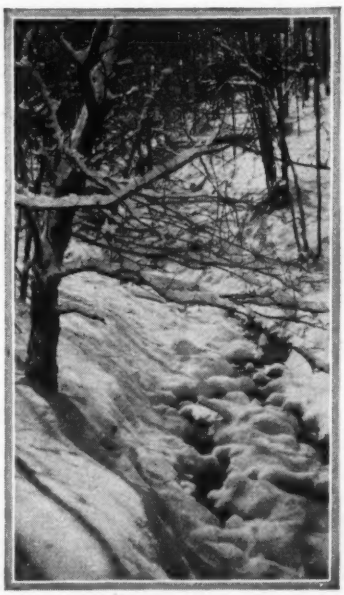
DEDICATED by that birthright to centuries of honest service, this folk-tale fancy tells us that their Christmas voices sound the common talk of brave and gentle lives. Their animal talk would be about the daily lot of each in the betterment of some precious place of little world-wide consequence—as to the plowing of a straighter furrow, the growing of more beautiful fleeces, the brimming up of flowing milk pails, the abundance of fields and pastures, the com-

fort of still waters, and the wonderful goodness of man. About the morning and the evening, the sun on the meadows, the chirp of the chickadee, the sweat of noontide, the cooling twilight, the scent of hayfields, and the steady light in the homestead door. Of these would they, like us, make quiet comment.

Toiling here and erring there, weakness and strength in touching combination, this imaginary livestock communion holds something perchance of benefit to men, their masters.

The day breaks, the charm ceases, the children of the happy farm arise to clamor joyfully around the tree. We unbar the doors, light the fires, and scrape the frosty panes to see our braes and byres reflect the glory of another welcome Christmas morning.

At this time we are prone to think much in fond and reverent retrospect, counting perchance the favors and the fortunes of which we partook in those bygone seasons. Much as we male elders feel the shortcomings in the dimensions of half hose instead of childhood's long stockings on Christmas eve, it should not be altogether a time of regret over past pleasures.



Beatitudes of the vanished holidays are dearly treasured, but the present and the future are still ours in which to enjoy our lives anew amid the mirth of our children and the comfort of our homes.

He who merely lives his red letter days in a certain constrained fashion and then plunges back once more into a desert of worry and a morass of fear until the next Christmas comes is cheating himself and punishing his friends.

I am sure that you have regarded Holly Time as a relaxing and refreshing spot on the march of the months. But instead of bending down for one deep draught of its perennial springs, let us fill our mental canteens so as to carry with us some of that water of life and love to revive us on the dusty trail we shall be forced to follow in labor through the year.

Come then, my friends, smuggle those mysterious bundles into the house through the back door or the cellar window; hide them in locked drawers or leave them for awhile at the neighbors' until the time arrives when the little tree shall be trimmed and the inquisitive children unwillingly shall be forced to bed. Tune on the radio to make Christmas carols loud enough to muffle the rattling of the paper and the squeaking of those unhappy toy dogs while you are busy doing the honors expected by the expectant ones.

Stoke the furnace again, wind the clock on the mantel, pat the lumpy stockings as they hang there in a row in the ghostly firelight, count your checking account once more for the fifteenth time, and then heave yourself onto the mattress.

'Tis here once more! The Night Before Christmas with its vivid delight and maddening uncertainty; only this time *you* are the responsible one whose actions occupy the center of the stage which childhood has set for its annual drama.

Therefore, to be a good parent now is to be a successful Santa Claus. Whatever you do, beware of combustible whiskers!

A Devotional Skunk

A skunk and her four baby skunks were basking in the sun when a big hound dog made his appearance.

"Children," said the mother skunk, "let us spray."

"I asked her to kiss me, without avail."

"I don't like kissing through those things either."—*The Enamelist.*

"I'd like to git a couple gallons, Jim."

"Jest a minute, Anse. It ain't aged yit."—*Judge.*

No Fault of His

There was a fearful crash as the train struck the car. A few seconds later Mr. and Mrs. Pickens crawled out of the wreckage. Mrs. Pickens opened her mouth to say something, but her husband stopped her.

"Never mind talking," he snapped. "I got my end of the car across. You were driving the back seat, and if you let it get hit, don't blame me!"

Close Shave

"Ah wins."

"What you got?"

"Three aces."

"No you don't. Ah wins."

"What you got?"

"Two nines an' a razor.

"You sho' does. How come you is so lucky?"

Linguistic Miracle

Mrs. Nouveau Riche—"He's getting on so well at school. He learns French and algebra. Now Ronnie, say 'How d'ye do' to the lady in Algebra."

"Why the gloom, Osmond? Girl not coming?"

"Oh! She's coming, all right; but she can't even send a telegram without saying 'stop' after every sentence."—*Penn State Froth.*

Probably Does

Racterinchatzopeubedsaqpe is the verb meaning "to love" in the language of a certain Eskimo tribe. This probably accounts for the long night in the Arctic.—*Royal Gaboon.*

A Frenchman, being troubled with gout, was asked what difference there was between that and rheumatism. "One very great difference," replied Monsieur. "Suppose you take a vise, put your finger in, you turn the screw till you can bear him no longer. Zat is rheumatism. Zen s'pose you give him one turn more. Zat is gout!"

CLASS DISMISSED—NO!

Frosh: "Are they very strict at Cornell?"

Soph: "Are they? Well, when a man dies during a lecture they prop him up in the seat until the end of the hour."—*Cornell Widow.*

Worse Yet

The old lady was looking for something to grumble about. She entered the butcher's shop with the light of battle in her eyes.

"I believe that you sell diseased meat here!"

"Worse," replied the butcher blandly.

"What do you mean, worse?" demanded the astonished patron.

"The meat we serve is dead!" confined the butcher in a stage whisper.

The Dawn

Pat was a bashful lover, and Biddy was coy, but not too coy.

"Biddy," Pat began timidly, "did ye iver think of marryin'?"

"Sure, now, th' subject niver intered me thoghts," demurely replied Biddy.

"It's sorry Oi am," said Pat, turning away.

"Wan minute, Pat!" called Biddy softly. "Ye've set me a thinkin'."

The Scotchman's Lament

A Scottish minister was on his usual rounds when he came across one of his old friends.

"And how is the world treating you, Jock?" asked the minister.

"Very seldom," replied Jock sadly.

Worst to Come

Wife (during quarrel)—"After all, I've given you the best seven years of my life."

Hubby—"My God! Are those your best?"

Mildred (icily)—"And shall I return the engagement ring?"

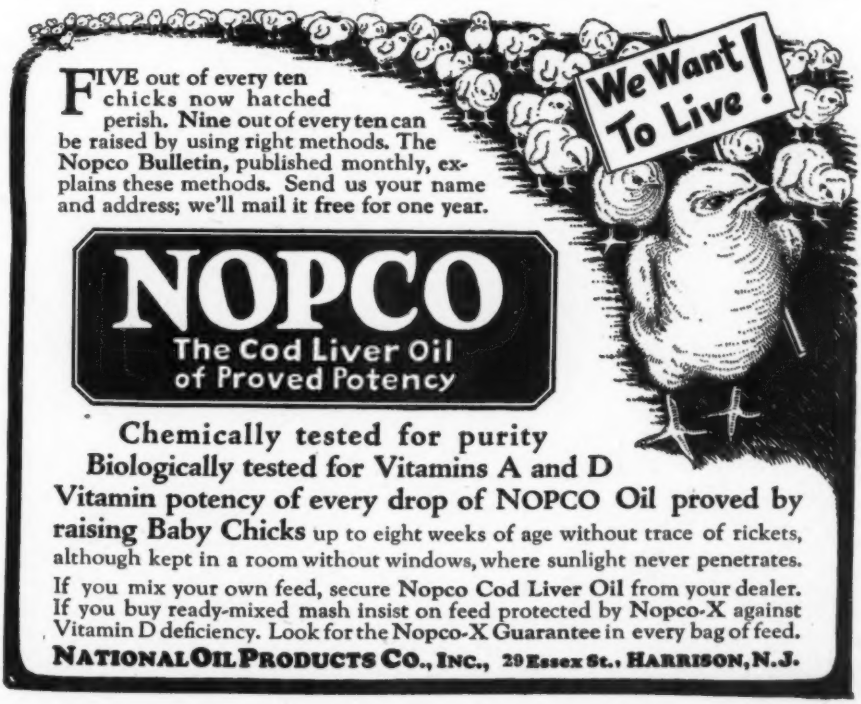
Frank—"Oh, no, don't bother; I'll just have the notice of the next installment sent to you."

Presumptive Evidence

Mose: "Whar you goin', Rastus?"

Rastus: "Ah's lookin' for work."

Mose: "Clar to goodness, Ah's glad to heah Mandy's up and aroun' again."



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